

Vol. XIV

No. 8

DISSERTATION ABSTRACTS

(formerly MICROFILM ABSTRACTS)

*A GUIDE TO DISSERTATIONS AND
MONOGRAPHS AVAILABLE IN MICROFORM*

\$6.00 PER YEAR

\$1.50 SINGLE COPIES



DOCTORAL DISSERTATION SERIES

Cooperating Institutions

University of Arizona	University of Missouri
University of Arkansas	University of Nebraska
Boston University School of Theology	University of New Mexico
Bradley University	New York University
Brown University	Northwestern University
Bryn Mawr College	University of Notre Dame
University of Buffalo	The Ohio State University
The Claremont Graduate School	The University of Oklahoma
Clark University	University of Pennsylvania
Colorado State College of Education	The Pennsylvania State University
Columbia University	University of Pittsburgh
University of Connecticut	Princeton University
Cornell University	Purdue University
University of Florida	Rutgers University
Florida State University	St. Louis University
George Peabody College for Teachers	University of South Carolina
University of Houston	Stanford University
University of Illinois (including Chicago Professional Colleges)	Syracuse University
Indiana University (including the Graduate Schools of Education and Music)	Vanderbilt University
State University of Iowa	University of Virginia
University of Kansas	Virginia Polytechnic Institute
Lehigh University	Washington University
Louisiana State University	University of Washington
University of Michigan	Wayne University
Michigan State College	Yale University
University of Minnesota	Yeshiva University

Vol. XIV

No. 8

DISSERTATION

ABSTRACTS

(formerly MICROFILM ABSTRACTS)

*A GUIDE TO DISSERTATIONS AND
MONOGRAPHS AVAILABLE IN MICROFORM*

UNIVERSITY MICROFILMS
ANN ARBOR, MICHIGAN: 1954

LITHOPRINTED IN THE UNITED STATES OF AMERICA BY
CUSHING - MALLOY, INC., ANN ARBOR, MICHIGAN, 1954

INTRODUCTION

DISSERTATION ABSTRACTS is a vital link in the process of publishing doctoral dissertations, since it makes possible the widespread distribution of information concerning the dissertations which are published in their entirety on microfilm, microcards, or microprint.

The degree to which graduate schools in America make use of this publication service, determines the value of DISSERTATION ABSTRACTS as a bibliographical tool. For its fullest use an understanding of the publication procedure is necessary. Briefly this is as follows:

- a. The author submits a carefully typed ribbon copy of the manuscript ready for publication without corrections.
- b. He also submits an abstract of 600 words or less, accurately describing the contents of the manuscript, as a guide, but not as a substitute for the complete dissertation.
- c. Both the abstract and the manuscript must be approved by the candidate's committee and the Graduate Dean as ready for publication.
- d. The manuscript is microfilmed and the negative carefully inspected and put in the vault of University Microfilms for storage, where it is kept available for purposes of duplication upon request.
- e. The abstract is printed in DISSERTATION ABSTRACTS, which is distributed, both in this country and abroad, to a large number of subscribing libraries as well as to leading abstracting services.
- f. The charge for this service is \$20.00 irrespective of the size of the manuscript.
- g. Anyone, after consulting the abstract and concluding the complete manuscript would be of value, can obtain a microfilm copy from University Microfilms at 1 1/4 cents per page, or as a paper enlargement at 10 cents per page.

There are varying degrees of partial participation in this plan available at the option of the institution. Titles only will be listed in DISSERTATION ABSTRACTS for a charge of \$2.00 each. When a university wishes to prepare its own negatives according to certain specified standards, and have that negative stored at University Microfilms where it will be available for duplication, the charge is \$12.00, which includes publication and distribution of the abstract and storage of the negative. Conceivably certain institutions will wish not only to prepare their own negatives, but to service copies as well in either microfilm, microcard or microprint. In this instance the abstract will be printed in DISSERTATION ABSTRACTS, and any requests for copies will be forwarded to the servicing institution. Interested institutions should write University Microfilms for further details of this service.

This method separates the two necessary functions of publishing: notification, or the process of informing prospective users of the existence and contents of a manuscript and distribution, or the furnishing of a copy upon demand. Each of these functions pays its own way, since if no one wishes a copy, the investment is small. However, if there is a demand, copies can be produced at current book rates.

It is anticipated that by enlarging the scope of DISSERTATION ABSTRACTS this publication will become of increasing value to librarians and scholars as a research tool. If this ideal is to be realized, close cooperation between sponsoring institutions, doctoral candidates, and University Microfilms is of the utmost importance. Now that the service is available to all Graduate schools regardless of the way its candidates publish their dissertations, it is hoped that the goal of a complete bibliography of doctoral dissertations may be realized within the next few years. Institutions are urged to write for further details.

Beginning with Volume XIV, DISSERTATION ABSTRACTS will be published monthly.

Back Issues

Libraries wishing to complete their files of DISSERTATION ABSTRACTS (MICROFILM ABSTRACTS prior to volume XII) may purchase the following issues, of which we have a small supply, at the standard price of \$1.50 each issue.

VOL.	ISSUE	VOL.	ISSUE
7	1	12	1
			2
8	2		3
			4
10	3		5
	4		6
11	1	13	1
	2		2
	3		3
	4		4
			5
			6
		14	1
			4
			6
			7

A microfilm copy can also be supplied of the first 10 volumes at a cost of \$46.60.

CONTENTS

AGRICULTURE

AGRICULTURE, GENERAL

- EHRlich, Walter Arnold. Pedological processes of some Manitoba soils. 1117
- HOUK, Wallace Eugene. A study of some events in the development of entomology and its application in Michigan. 1117
- ISAACS, Gerald William. The design of simplified equipment for the rapid determination of the moisture content of grain and forage crops. 1118

AGRICULTURE, ANIMAL CULTURE

- WELLINGTON, George Harvey. Body composition and carcass changes of young Holstein cattle. 1119

AGRICULTURE, FORESTRY AND WILDLIFE

- BECKING, Rudolf Willem. Site indicators and forest types of the Douglas fir region of western Washington and Oregon. 1119
- PETERLE, Tony John. The Sharp-tailed Grouse in the Upper Peninsula of Michigan. 1120
- STEINBRENNER, Eugene C. The effect of tractor and hi-lead logging on the physico-chemical properties of some southwestern Washington soils in relation to natural regeneration. 1121
- STOEHR, HENRY ARTHUR. Stand conditions affecting form factor in trembling aspen. 1122
- STURGEON, Edward Earl. Trends in land use and ownership in Cheboygan County, Michigan, as affected by socio-economic development and the land disposal policy of the Michigan Department of Conservation, with emphasis on lands sold to private owners by the State of Michigan. 1122

AGRICULTURE, PLANT CULTURE

- HOUGH, Hugh Walter. The effect of different phosphate carriers and lime on the yield and phosphorus content of alfalfa, beans, and wheat. 1123
- JOHNSON, Herbert Gordon. Investigations on the control of root rot of canning peas. 1124
- KLINGMAN, Dayton Lawrence. Interrelations of methods of weed control and pasture management. 1124

- RAO, Surapaneni Nageswara. Certain physiological and morphological responses in potatoes and onions induced by maleic hydrazide. 1125

- WALKOF, Charles. Double backcrossing as a possible method of developing an early, large-fruited tomato. 1126

ANATOMY

- COOPER, William Gregory. A histochemical study of the succinic dehydrogenase activity in the pre-natal and post-natal rat heart. 1126
- MIZERES, Nicholas James. The anatomy of the autonomic nervous system in the dog. 1127
- PITEL, Martha. Variations in the broncho-vascular patterns of the left lower lobe of fifty lungs. 1127

BACTERIOLOGY

- PETERSON, Glen Ervin. Role of antibiotics in the nutrition of the rat and certain bacteria. 1128
- ROESSLER, William George. Clostridium sporogenes and related proteolytic anaerobic bacteria. 1129

BIOLOGY - GENETICS

- ANNAN, Murvel Eugene. The effects of X-rays on the fecundity and fertility of Drosophila robusta females. 1130
- BOTHUN, Robert Elroy. A study of the inheritance of certain characters in a cross of two flax varieties as expressed in populations sprayed with 2,4-D. 1130
- CAMPBELL, Allan Barrie. A monosomic analysis of Redman wheat for stem rust resistance. 1131
- HATHAWAY, Charles Odbert. Cytological and culture studies of Mesostoma ehrenbergii wardii. 1131
- HITCHCOCK, Claude Raymond. Attempts to abet the action of methylcholanthrene in the induction of gastric cancers in mice, using dietary chemical additives and dietary deficiencies. 1131
- WEEKS, Leo. Studies on the subspecies Drosophila melanica melanica and Drosophila melanica paramelanica. 1132

BOTANY

- FARQUHARSON, Lois Irene. Apomixis, polyembryony and related problems in *Tripsacum*. 1134
- LONG, JR., Robert William. A biosystematic investigation of *Helianthus giganteus* L. and related species. 1134
- ROTHWELL, Norman Vincent. The origin and significance of aneuploidy in *Claytonia virginica*. 1135
- STOUTAMIRE, Warren Petrie. *Gaillardia pulchella* and *Gaillardia aristata*: the morphological and cytological variation and the taxonomy of their wild and cultivated races. 1136
- WEIHING, John Lawson. The etiology and control of false smut of buffalograss caused by *Cercospora seminalis*. 1136
- JACOBSON, Charles Robert. Correlation of structure and reactivity in tetrazoles. 1143
- JONES, John Donald. Benzo-1,4-oxathiadiene. 1143
- LOCKWOOD, Robert G. Studies in the rearrangement of allylic imido ethers. 1144
- MOORE, William Robert. The synthesis and rates of hydrolysis of some di-benzcycloalkenylchloromethanes. 1145
- MOST, JR., Elmer Edwin. The preparation of quaternary hydrazones. 1146
- ROSS, Alexander. The relative stabilities of cis - trans isomers of fused ring systems containing angular methyl groups. 1146
- ROWLAND, Bertram Irwin. A study of 1,3-shifts. 1146
- SMITH, JR., Chester Earl. A study of some mixed azo nitriles. 1147
- SWEENEY, William Alan. The synthesis and some properties of certain aromatic ketones: Part I. The high dilution Friedel-Crafts intramolecular acylation reaction. Part II. Spectral studies of certain benzene ring and substituent interactions. 1148
- WASSERMAN, William Jack. A study of the condensations of alpha, beta-unsaturated ketones with aldehydes. 1148

CHEMISTRY

CHEMISTRY, GENERAL

- KOHLHASE, William Lawrence. Cycloparaffins VIII: the preparation of two 1-acyl-2-nitro-2,3,3-trimethylcyclopropanes and their reaction with alkalis. 1137

CHEMISTRY, BIOLOGICAL

- BRAWERMAN, George. Studies on enzymes involved in nucleic acid metabolism. 1138
- CUNNINGHAM, David Kenneth. Comparative studies of the chemical and physical properties of some cereal proteins. 1138
- DAVIE, Earl Warren. I: The effect of carboxypeptidase on various crystalline proteins and its relation to the trypsinogen-trypsin system. II: Identification and characterization of a peptide split from trypsinogen during autocatalytic activation. 1139
- MCGUCKIN, Warren Francis. The partial synthesis and physiologic study of some analogs of adrenal hormones. 1140
- POPP, Edward M. Studies on the relationship between pteroylglutamic acid and coenzyme A. 1140
- RUDNICK, JR., Arthur William. Effect of heat during processing of nonfat dry milk solids used for cottage cheese manufacture. 1141
- THOMAS, Alan. A study of the mechanism of sulfhydryl action in milk. 1142

CHEMISTRY, ORGANIC

- BRODOWAY, Nicolas. The rearrangements of allyl ethers of some hydroxymethylene compounds. 1142

CHEMISTRY, PHARMACEUTICAL

- RHODES, Harold Jesse. The synthesis of 2-hydroxyoctahydroquinolizine and some of its esters. 1149

CHEMISTRY, PHYSICAL

- EGAN, James John. Measurement of the angular variation of light scattered from single droplets. 1150
- ERIKSON, Jay Arthur. Some primary salt effects with some paraffin-chain salt solutions. 1150
- GAMBLE, Ernest. A new volumetric-gravimetric apparatus and phase diagrams for binary vapor adsorption. 1151
- GARRETT, SR., Bowman Staples. The crystal structures of oxalic acid dihydrate and alpha iodic acid as determined by neutron diffraction. 1152
- HISATSUNE, Isamu Clarence. Infrared intensities and bond moments of formaldehyde. 1152
- LOONEY, Catharine Elizabeth. Structures and π -electron spectra: triphenylmethane dyes. 1153
- LOONEY, JR., Franklin Sittig. The homogeneous catalysis of the thermal trans-cis isomerization of dideuteroethylene. 1153
- MacLAREN, Richard Oliver. Equilibrium studies of iron bromide systems. 1153

- YOUNG, George Jamison. Heats of immersional wetting of solid surfaces in liquids. 1154

DOMESTIC SCIENCE

- MENTZER, Rosalind Blue. A history of the program of vocational home economics in the secondary schools of Michigan 1917-18 through 1952-53. 1156
- OTTOSON, Norma Oresta Thor. The effect on sulfur metabolism in women of varying the sulfur intake by providing different levels of protein intake and by giving a methionine supplement at each level of protein intake. 1156

ECONOMICS

ECONOMICS, GENERAL

- CHANCES, Ralph Jonathan. Theory and practice of minimum wage legislation: the Massachusetts example. 1157
- MONTGOMERY, George. Wartime control of grain prices in the United States. 1158
- STANTON, Bernard Freeland. Using farm records in decision making in livestock production. 1158
- STUCKY, Harold Ralph. Settlement and repayment policies on irrigation projects. 1159

ECONOMICS, COMMERCE-BUSINESS

- COOKE, Blaine McLyman. Economic education in industry. 1160
- MULLEN, James Joseph. Some relationships between the volume of sales of Green Giant Brand Peas and advertising in seventy-four market areas. 1160
- PATON, JR., William Andrew. The impact of inflation on corporate monetary items. 1161
- TRUMBULL, Wendell Piggott. Corporate reporting of special income items. 1161

ECONOMICS, FINANCE

- SCHLOSS, Henry Hans. The bank for international settlements reconsidered. 1162
- TAYLOR, Arthur Merle. The taxation of insurance companies, banks, and building and loan associations in Michigan. 1163
- VALENTINO, Salvatore. An evaluation of the application of the insurance principle in bank deposit insurance. 1163

EDUCATION

EDUCATION, GENERAL

- AARON, Ira Edward. The relationship of auditory-visual discrimination to spelling ability. 1164
- MORRISON, Richard D. Occupational opportunities in agricultural and related fields and their implications for agricultural education of Negro students. 1165
- NANTZ, Don Wright. The supervised correspondence study program at Benton Harbor (Michigan) High School. 1165
- SHEPARD, JR., Samuel. Motor coordination as a factor in reading readiness. 1166
- SHOEMAKER, Richard Warren. An investigation to determine the elements of mathematics needed to develop the theoretical content of the introductory course in engineering physics and fourteen undergraduate courses in electrical engineering. 1167
- SWEET, Robert Louis. A study of acceleration by examination in the Basic College at Michigan State College. 1167
- TENNY, John Willis. A study of epileptic children and a special school program for their care and education. 1168

EDUCATION, ADMINISTRATION

- EVANS, Milton D. A study of professional training needed by small school superintendents in the field of school buildings and maintenance. 1169
- FITZGIBBON, Thomas Joseph. The prediction of academic success of freshmen at Bradley University. 1170
- HAAS, Leonard Clarence. The academic dean in American teachers colleges. 1170
- HANKS, Charles Jerold. A comparative study of factors related to retention and withdrawal of freshman students at the University of Arkansas. 1171
- HOBBS, James Dwight. A study and analysis of the indebtedness of the public schools of Arkansas. 1172
- KRONG, Norman LeRoy. The in-service education of public school administrators. 1173

EDUCATION, ADULT

- SAVLI, Banu. Adult education in the democratic state of Turkey. 1174

EDUCATION, HISTORY

- UNGER, Paul. The attitudes of three patriotic societies toward education in Michigan, 1870 to 1950. 1174

EDUCATION, PSYCHOLOGY

- BANKS, Richmond Grenfell. A comparative study of certain aspects of the social adjustment of farm and nonfarm pupils in selected Minnesota high schools. 1175
- COOPER, Alva Critchley. A study of the group scales of the Strong Vocational Interest Blank as predictors of academic achievement and of the relationship of the group scales to primary interest patterns. 1176
- CORMAN, Bernard R. The effects of varying amounts and kinds of information as guidance in problem-solving. 1176
- FARWELL, Gail Frederic. An analysis of factors and criteria related to the admission of borderline cases at Michigan State College, fall quarter 1952. 1177
- GULDE, Carl J. The development of a technique for the prediction of pupil acceptability to high school teachers. 1178
- JOHNSON, Murray Clemens. Classification by multivariate analysis with objectives of minimizing risk, minimizing maximum risk, and minimizing probability of misclassification. 1178
- MUNRO, James Jackson Rutherford. The predictive value of entrance reading test scores at the University of Washington. 1179
- O'NEILL, Jack Henry. An analytical survey of personnel practices in fifty-seven industries in Indiana. 1180
- POUNCEY, Anthony Truman. Psychological correlates of journalism training completion. 1180
- SIEVERS, Frank Leslie. Principles and practices of guidance in elementary schools. 1181
- WHITCOMB, John Charles. The determination of the relationship between personality characteristics and the nature and persistence of problems in the Protestant ministry. 1182

EDUCATION, TEACHER TRAINING

- ANDERSON, William Carlisle. Student teaching in industrial arts education; a report of a survey of student teaching in higher institutions and in on and off-campus co-operating secondary schools: philosophy, practices, procedures, problems, evaluation. 1183

- CAMPBELL, Walter Harold. A survey and analysis of the most effective practices for the self-improvement of foreign language teachers in senior high schools in the United States. 1184

- SWANSON, Gordon I. Qualitative and quantitative variables affective successful experience in the agricultural education curriculum. 1185

- VANN, Charles Edward. Interrelationships between language guidance used by teachers and the social and developmental status of the child. 1185

EDUCATION, THEORY AND PRACTICE

- ALPER, Michael. Reconstructionism and Jewish education: the implications of reconstructionism for Jewish education in the United States. 1186
- ERBER, Elmer E. Values and industrial arts education. 1187
- LINDEMEYER, Ray S. A scientific approach to the solution of technical problems with application to two technical-educational problems. 1187

ENGINEERING

ENGINEERING, CHEMICAL

- NAPHTALI, Leonard Mathias. The adsorption of hydrogen and carbon dioxide on a nickel-Kieselguhr catalyst. 1188

ENGINEERING, CIVIL

- TAO, Chi-Kun. An investigation of continuous cylindrical shell roof structures of any number of spans with different types of loading and boundary conditions. 1189

ENGINEERING, ELECTRICAL

- McISAAC, Paul Rowley. A study of the initial permeability of ferromagnetic metals at high frequencies. 1189
- PETERSON, William Wesley. The trajectron—an experimental dc magnetron. 1190
- STOUT, Thomas Melville. A step-by-step method for the transient analysis of non-linear feedback systems. 1190

ENGINEERING, HYDRAULIC

- PRIEST, Melville Stanton. Wave heights within a harbor due to swell entering through a breakwater gap. 1191

ENGINEERING, MECHANICAL

- MACKAY, Donald Bawden. The flow of saturated water and of cold water through a valve. 1192
- SHEN, Chi-Neng. Effect of non-linear process elements on the stability of closed loop control systems. 1192
- SIEGLER, Newman. A study of some factors affecting element time in manual work. 1193

ENGINEERING, METALLURGY

- CHEN, Chih-Wen. The cubic to tetragonal diffusionless phase change in the gold-cadmium system. 1193
- HALL, Richard Carleton. Ordering and magnetic annealing of the 50 iron - 50 cobalt alloy. 1194
- PHILLIPS, Charles William. The effect of heat treatment on the structure of a commercial titanium-rich alloy. 1194

ENGINEERING, MINING

- AYTAMAN, Süleyman Vedat. Fragmented material behavior in vertical containers of circular cross-section. 1195

GEOGRAPHY

- BURNS, Bert Earl. Artificial drainage in Blue Earth County, Minnesota. 1196
- STEINER, Rodney. An investigation of selected phases of sampling to determine quantities of land and land-use types. 1196

GEOLOGY

- ARNOTT, Ronald James. Particle sizes of clay minerals by small-angle x-ray scattering. 1197
- BARNES, James Virgil. Structural analysis of the northern end of the Tobacco Root Mountains, Madison County, Montana. 1198
- BROPHY, Gerald Patrick. Hydrothermal alteration and uranium mineralization in the silica hills area, Marysvale district, Utah. 1198
- BROWN, Bahngrell Walter. A study of the northern Black Hills Tertiary petrogenic province with notes on the geomorphology involved. 1198

- COOK, Earl Ferguson. Geology of the Pine Valley Mountains, Utah. 1199

- SCOTT, Willard Frank. Regional physical stratigraphy of the Triassic in a part of the Eastern Cordillera. 1199

- WALLACE, Stewart Raynor. The petrology of the Judith Mountains, Fergus County, Montana. 1200

- WEISS, Martin. Ostracods of the family Hollinidae from the Middle Devonian formations of Michigan and adjacent areas. 1200

HEALTH SCIENCES

HEALTH SCIENCES, GENERAL

- CHANG, Yet Oy. Soybean products as supplements to rice in Chinese diets with special reference to their protein and calcium content. 1201

HEALTH SCIENCES, PUBLIC HEALTH

- MICHAELS, Rhoda Marquita. The pathogenicity and antigenicity of *Entamoeba histolytica*. 1201
- SMITH, Vaughn. Educational activities performed by personnel in public health departments of an American commonwealth. 1202

HISTORY

HISTORY, GENERAL

- MICKEY, David Hopwood. Senatorial participation in shaping certain United States foreign policies, 1921-1941: (being largely a study of The Congressional Record). 1203

HISTORY, ANCIENT

- SINNIGEN, William Gurnee. The officium of the urban prefecture during the later Roman Empire. 1203
- SNYDER, John William. A catalogue of the cuneiform tablets in the Davenport Public Museum. 1204

HISTORY, MODERN

- BORGER, JR., Henry Charles. The role of the army engineers in the westward movement in the Lake Huron-Michigan Basin before the Civil War. 1205
- BOWMAN, Albert Hall. The struggle for neutrality: a history of the diplomatic relations between the United States and France, 1790-1801. 1205

- BRANDENBURG, David John. French agriculture: technology and enlightened reform, 1750-1789. 1206
- CHUTE, William Joseph. The life of Frederick A. P. Barnard to his election as president of Columbia College in 1864. 1207
- HU, Chang-Tu. The Yellow River Administration in the Ch'ing dynasty. 1207
- KOHLMEYER, Frederick William. The movement toward international cooperation in food and agriculture: background of the FAO of the UN. 1208
- MULVIHILL, C.S.B., (Rev.) Daniel Joseph. Juan de Zumárraga, first Bishop of Mexico. 1209
- SCHEICK, Donald Bowie. The regulation of commodity currency in colonial Virginia. 1210
- STEVENS, John Christopher. Anacharsis Cloots and French cosmopolitanism: The Death of an Idea. 1210

JOURNALISM

- DAVIS, Norris Garland. Freedom of the press in Texas: a comparative study of state legal controls on mass news media. 1211

LANGUAGE AND LITERATURE

LANGUAGE AND LITERATURE, GENERAL

- BLEZNICK, Donald William. Fadrique Furió Ceriol, political thinker of sixteenth century Spain. 1212
- BRIGGS, Fred Allen. Didactic literature in America: 1825-1850. 1212
- BUTZ, Hazel Emma. The relation of T. S. Eliot to the Christian tradition. 1213
- LILL, James Vernon. Dryden's adaptations from Milton, Shakespeare, and Chaucer. 1214
- METZGER, Charles Reid. The transcendental esthetics in America: essays on Emerson, Greenough, Thoreau, and Whitman. 1214
- MOTE, Frederick Wade. T'ao Tsung-i and his Cho Keng Lu. 1215
- PATERSON, John. The Return of the Native: a study in the genesis and development of a novel. 1216
- SHELDON, James Gail. The orientation of Nicolas Berdyaev: his relation to Jacob Boehme, Fyodor Dostoyevsky, Friedrich Nietzsche, and Henrik Ibsen. 1216

LANGUAGE AND LITERATURE, MODERN

- BOYD, Evelyn Mae. Dante Gabriel Rossetti's The House of Life: a study of its Italian background. 1217

- BRYANT, II, William Cullen. Bryant: the middle years; a study in cultural fellowship. 1218
- CASAS, Rogelio Alberto. Joan Maragall: Catalan poet (1860-1911). 1218
- CLARK, JR., William Harrington. Christoph Martin Wieland and the legacy of Greece: aspects of his relation to Greek culture. 1219
- NAHAS, Helene. *Étude de la femme dans la littérature existentielle française: Jean-Paul Sartre et Simone de Beauvoir*. 1220
- SCHWARTZ, Henry Charles. Gabriel Miró (1879-1930): a thematic analysis of the secular works. 1220
- SCHWARZ, Egon. Rationalism and irrationalism in Lichtenberg as seen in his attitude toward national and racial problems. 1221
- THURBER, Richard Montgomery. The cultural thought of Karl Emil Franzos. 1222
- WOLFSON, Lester Marvin. A rereading of Keats's odes: the intrinsic approach in literary criticism. 1223

LIBRARY SCIENCE

- SHARMA, Jagdish Saran. Mahatma Gandhi: a descriptive bibliography. 1223

MATHEMATICS

- AUSLANDER, Maurice. Relative cohomology theory of groups and continuations of homomorphisms. 1225
- BUCHSBAUM, David Alvin. Exact categories and duality. 1225
- GASS, Clinton Burke. Eigenfunction expansions associated with certain irreducible partial differential equations. 1226
- NEWTON, Douglas Vern. A generalized form of the problem of Bolza in the Calculus of Variations. 1227
- NORMAN, Robert Zane. On the number of linear graphs with given blocks. 1227
- PENEZ, Jacqueline Lydie. Approximation by boundary values of analytic functions. 1228
- PRESTON, Gerald Cowles. On locally compact totally disconnected Abelian groups and their character groups. 1229
- RAIMI, Ralph Alexis. Equicontinuity of linear transformations. 1230
- WALTER, John Harris. Automorphisms of the projective unitary groups. 1230

MINERALOGY

- BEAUMONT, Donald Frank. Significance of clays in southeast Missouri lead ores. 1231

MUSIC

- BOLEN, Charles Warren. Open-air music of the Baroque: a study of selected examples of wind music. 1232
- NELSON, Carl Bertil. An experimental evaluation of two methods of teaching music in the fourth and fifth grades. 1232
- VENETTOZZI, John Thomas. Band works of Tommaso Venettozzi edited and rescored. 1233

PHILOSOPHY

- ANTON, John Peter. The doctrine of contrariety in Aristotle's philosophy of process: an essay on Aristotle's metaphysics of distributive being. 1234
- ARFA, Milton. Abraham ibn Daud and the beginnings of medieval Jewish Aristotelianism (with particular reference to the concept of substance in the Emunah Ramah). 1234
- ASHMORE, Jerome. Santayana's theories of art and aesthetics: an introductory study. 1235
- BOARDMAN, William Giles. Hobbes' account of mind and knowledge. 1236
- CARMICHAEL, Douglas. Order and human value. 1236
- CASTAÑEDA, Héctor Neri. The logical structure of moral reasoning. 1237
- GRAVA, Arnolds. L' aspect métaphysique du mal dans L'oeuvre littéraire de Charles Baudelaire et d' Edgar Allan Poe. 1238
- HANDY, Rollo Leroy. The philosophic critique of naturalistic ethics. 1238
- MYERS, Charles Mason. The role of determinate and determinable modes of appearing in perception. 1239
- RIEPE, Dale Maurice. Early Indian philosophical naturalism. 1240

PHYSICS

PHYSICS, GENERAL

- BADE, William Lemoine. A study of specific interactions between macromolecules. 1240
- BELMONT, Emanuel. Reactions of 370 Mev protons with cobalt. 1241
- MACK, John Edward. Density measurement in shock-tube flow with the chrono-interferometer. 1241
- MENDLOWITZ, Harold. Theory of an electron in a magnetic field with applications to the measurement of the gyromagnetic ratio of the free electron. 1241

PHYSICS, ELECTRONICS & ELECTRICITY

- KMETKO, Edward Andrew. Electronic and structural properties of condensed aromatic molecular solids, carbons and polycrystalline graphites: I. The energy gap in condensed aromatic molecular solids. II. Studies of carrier concentrations in carbons and polycrystalline graphites. III. Structure and graphitization of fine coke particles and of thermal carbon blacks. 1242

PHYSICS, NUCLEAR

- HOLMGREN, Harry Dahl. The experimental determination of the differential cross sections for the $C^{12}(d,p)C^{13}$ reaction for 3.29 Mev. incident deuterons and the $C^{13}(d,t)C^{12}$ reaction for 2.19 Mev. and 3.29 Mev. incident deuterons as a function of the angle of the emitted particles. 1243
- SLATTERY, Richard Erick. Design and construction of a thin lens coincidence spectrometer with applications to the decay of Eu^{152} and Eu^{154} . 1243

PHYSIOLOGY

- CAMPBELL, Gilbert S. Effect of pH changes on vagal inhibition of the heart. 1244
- GEBER, JR., William Frederick. A study of the effect of phenylhydrazine on aerobic and anaerobic metabolism of avian erythrocytes. 1244

POLITICAL SCIENCE

POLITICAL SCIENCE, GENERAL

- CLINCHY, JR., Everett Ross. Equality of opportunity for Latin-Americans in Texas: a study of the economic, social, and educational discrimination against Latin-Americans in Texas, and of the efforts of the state government on their behalf. 1245
- SUTTON, Joseph Lee. A political biography of Inukai Tsuyoshi. 1246
- WALLACE, Alice Wellington. Public Welfare Administration in Michigan at the city-county level with special reference to Ingham and Saginaw Counties. 1246
- WALTER, Austin Frederic. Australia's relations with the United States: 1941-1949. 1247

POLITICAL SCIENCE: INTERNATIONAL LAW AND RELATIONS

- RUPEN, Robert Arthur. Outer Mongolian nationalism, 1900-1919. 1247

POLITICAL SCIENCE: PUBLIC ADMINISTRATION

- PENNIMAN, Clara. Recent developments in the administration of the state income tax. 1248
- RICHERT, Robert Benjamin. Participation of citizens in advisory committees and administrative boards: selected Michigan cities, 1945-1952. 1249

PSYCHOLOGY

PSYCHOLOGY, GENERAL

- DUNNETTE, Marvin Dale. A special analogies test for the evaluation of graduate engineers. 1250
- MANDEVILLE, Paul Fredrick. A study of the relationship between responsiveness to color on the Rorschach examination and impulsive behavior. 1251
- MARTORANA, Anna Agnes. A comparison of the personal, emotional, and family adjustment of crippled and normal children. 1251
- MCCORNACK, Robert Lindy. Sex differences in the vocational interests of a professional group. 1252
- ROADMAN, Harry Edward. Relationship of measured interests to career data for Air Force officers in the comptroller field. 1253
- SAKHEIM, George A. Suicidal responses on the Rorschach test: a validation study. Protocols of suicidal mental hospital patients compared with those of non-suicidal patients. 1253

PSYCHOLOGY, CLINICAL

- BRAASCH, JR., William Frederick. Regional differences in occupational interests. 1254
- BUHLER, Robert Adolph. Flicker fusion threshold and anxiety level. 1255
- CAMP, Bonnie Webb. The formation and recall of associations as a function of syllable familiarity and frequency of pairing. 1255
- DREVDAHL, John E. An exploratory study of creativity in terms of its relationships to various personality and intellectual factors. 1256
- DREYER, Albert Stanley. Behavior in a level of aspiration situation as affected by group comparison. 1256
- HEWER, Vivian Humphrey. Vocational interest-achievement-ability: interrelationships at the college level. 1257
- HOLBROOK, Jack Denton. The influence of anxiety and task complexity on the learning of concepts. 1258

- MILLS, William Willis. MMPI profile pattern and scale stability throughout four years of college attendance. 1259
- SEGAL, Alzire Sophia Block. The prediction of expressed attitudes toward the mother. 1259
- SLOCOMBE, Edna Elizabeth. The relation of certain aspects of anxiety to performance on the Bender Visual-Motor Gestalt test. 1260

PSYCHOLOGY, EXPERIMENTAL

- BOREN, John Jay. Response rate and resistance to extinction as functions of the fixed ratio. 1261
- GLOYE, Eugene Ernest. The learning and retention of neutral materials as a function of the values of the contexts in which they appear during learning. 1261
- LOCKMAN, Robert Frank. An evaluation of naval aviation cadet selection measures using multivariate discriminatory statistical techniques. 1262
- MATHERS, Boyd L. Learning theory and induced anxiety in the rat. 1263
- RATNER, Stanley C. Effect of extinction of dipper approaching on extinction of dipper approaching and bar pressing. 1263
- SWETS, John Arthur. An experimental comparison of two theories of visual detection. 1264
- WOODWARD, Donald P. Temporal and effort factors in the acquisition and extinction of an avoidance response. 1265

RELIGION

- BOSLOOPER, Thomas David. The Virgin Birth in modern criticism. 1266
- CLINEBELL, JR., Howard John. Some religious approaches to the problem of alcoholism. 1266

SOCIAL PSYCHOLOGY

- MONK, Mary Alice. Some effects of group membership on attitudes and the perception of others' attitudes. 1267
- SCOTT, William Abbott. The avoidance response to pictorial representation of threatening situations. 1268
- SEASHORE, Stanley Emanuel. Group cohesiveness as a factor in industrial morale and productivity. 1268

SOCIOLOGY

SOCIOLOGY, GENERAL

- BACKMAN, Carl Ward. Sampling mass media content: a comparison of one-stage and two-stage methods. 1269
- BOWMAN, LeRoy Edward. Funerals and funeral directors in the United States: a sociological analysis. 1270
- CATTON, JR., William Robert. Propaganda effectiveness as a function of human values. 1271
- CHINOY, Ely. The tradition of opportunity and the aspirations of automobile workers. 1271
- JEFFERY, Clarence Ray. An institutional approach to a theory of crime. 1272
- ZIMMER, Basil George. Adjustment of migrants in the urban area: a study of participation in the urban community in relation to migration experience. 1272

SOCIOLOGY, FAMILY

- NYGREEN, Glen Theodore. Marital adjustment in the University of Washington married student community. 1273

SOCIOLOGY, PUBLIC WELFARE

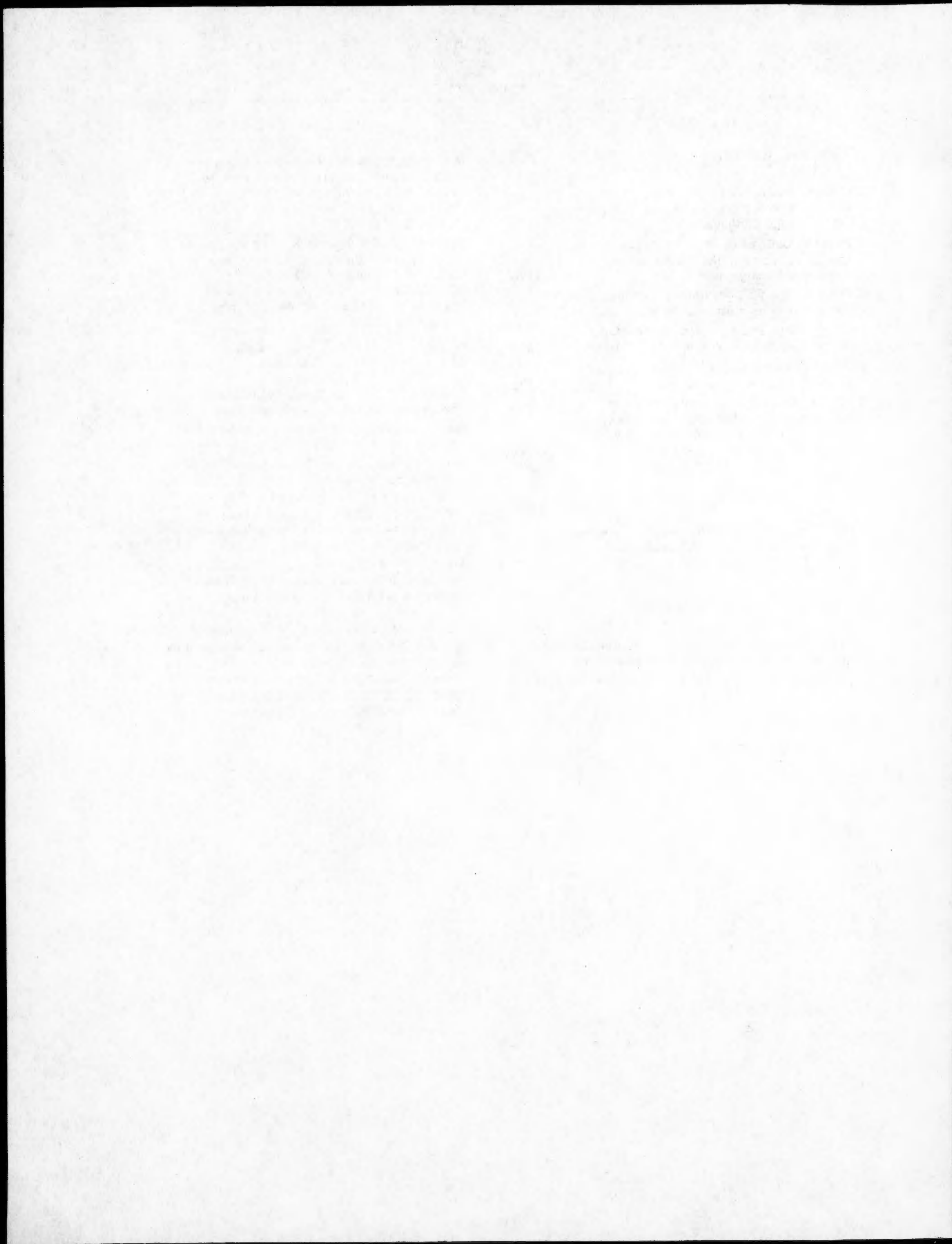
- ATTERBURY, Marguerite. A study of some phases of Chinese-American co-operation in promoting China's Agricultural Extension. 1274

SPEECH - THEATER

- MALONE, S.S.J., Sister Helen Daniel. An analysis and evaluation of phonemic differences in the speech of boys and girls at the kindergarten, first, second and third grade levels. 1275
- STOLZENBACH, Norma Frizzelle. The history of the theatre in Toledo, Ohio, from its beginnings until 1893. 1276
- NELSON, Roy Conrad. An experimental study of four methods of teaching beginning speech in college. 1275

ZOOLOGY

- HARRISON, Florence Louise Montana. Some excretory processes in the octopus. 1277
- MacPHEE, Craig. An experimental study of competition for food in fish. 1277
- MIROFF, Mary Brown Chin. A study of the cholesterol and ascorbic acid concentrations in albino rats, hamsters and turtles. 1278
- MITCHELL, Rodger David. Anatomy, life history, and evolution of the mites parasitizing fresh water mussels. 1279
- MURCHIE, William Roger. Natural history studies on the earthworms of Michigan. 1279
- SMITH, Stanford Henry. Life history of the lake herring, *Leucichthys artedii* (Le Sueur), of Green Bay, Lake Michigan. 1280
- TOLMAN, Robert Alexander. Determination of thyroid-stimulating hormone (TSH) in the blood of adult White Leghorn chickens. 1280
- TWENTE, JR., John W. Habitat selection of cavern-dwelling bats as illustrated by four vespertilionids. 1281



AGRICULTURE

AGRICULTURE, GENERAL

PEDOLOGICAL PROCESSES OF SOME MANITOBA SOILS

(Publication No. 8453)

Walter Arnold Ehrlich, Ph.D.
University of Minnesota, 1954

Adviser: P. R. McMiller

The study of pedological processes of certain Manitoba soils involved, physical, chemical and mineralogical analyses of the major horizons from ten profiles. The profiles represented were one Dark Brown - Black Transition, two Black Earths, one slightly Degrading Black Earth, one moderately Degrading Black Earth, one Grey Wooded, one Podzol, one Brown Podzolic, one Rendzina, and one Degrading Rendzina. All soils studied were well-drained series developed from Mankato till but they differed from each other in some aspect of climate, parent material or vegetation.

The study revolved around the interpretation and magnitude of the soil-forming factors, principally parent material, and the pedogenic processes of calcification, decalcification and podzolization.

As a result of the investigations the following conclusions are indicated:

1. Percentage of inorganic carbonates in the parent material is one of the most important factors in characterizing some Great Soil Groups. Particular reference is made to distinguishing Grey Wooded from Podzol or Brown Podzolic, Black Earth from Rendzina, and Prairie from Black Earth.

2. Composition of the parent material, in the case of Grey Wooded, Brown Podzolic and Podzol soils, is the controlling soil-forming factor in the differentiation of each Great Soil Group.

3. Mineralogical analysis of fine sands in these soils indicated that limestone was most strongly weathered, apatite was moderately affected, and the others revealed no weathering trends.

4. X-ray and differential thermal analyses of clay fractions revealed that montmorillonite and illite are the dominant minerals in the calcareous soils in Manitoba. Lower quantities of the two minerals were found in the Podzol soil.

5. Kaolinite was found in small quantities in all horizons of the four regional soils examined implying it is not a weathering product in situ.

6. The soils influenced by the calcification process are the Dark Brown - Black Transition, the Black Earths and the slightly Degrading Black Earth types. In these soils the mobility of silica, aluminum, iron, titanium, potassium, phosphorus and manganese is negligible although slight translocation of clay is indicated. Sodium, magnesium and calcium moved downward, but under virgin soil conditions some calcium and magnesium are returned to the surface by

vegetation. Organic matter, base saturation, and exchangeable bases are high; exchangeable calcium is highest in the colloidal complex, followed by magnesium, potassium and sodium.

7. The soils influenced by the decalcification process are the Degrading Black Earth, Degrading Rendzina, and the Grey Wooded types. In these soils, the apparent mobility of elements is in the following order: sodium, magnesium and calcium > potassium, iron, titanium and aluminum > silica, phosphorus and manganese. The return of calcium and magnesium to the surface by vegetation results in the maintenance of a comparatively high base saturation and a reaction near the neutral point. Organic matter is low and some organic colloids as well as clay colloids are translocated from the "A" to the "B" horizons. Exchangeable sodium is generally absent but the other bases are moderately high in the strongly leached "A₂" horizons.

8. Podzolization follows the decalcification process providing the original materials were high in bases, principally calcium. In the case of the Brown Podzolic and Podzol soils, the decalcification process was of little significance because the original sediments were low in total calcium and other bases. In podzolization, the precipitating effect of released calcium is negligible with the result that no appreciable amounts of clay accumulate in the "B" horizons. Any clay that is found is either moved downward or is altered.

9. The Brown Podzolic and Podzol soils examined are young soils in the primary stage of weathering. The relationship of these two soils with their counterparts in more humid, warmer and older regions, is morphological rather than chemical.

211 pages. \$2.64. MicA54-1633

A STUDY OF SOME EVENTS IN THE DEVELOPMENT OF ENTOMOLOGY AND ITS APPLICATION IN MICHIGAN

(Publication No. 8501)

Wallace Eugene Houk, Ph.D.
Michigan State College, 1954

A study of the development of entomology in Michigan, and some of the implications of that development, was conducted by the following methods:

1. Reviewing literature in Michigan libraries.
2. Consulting literature requested from out-of-state libraries, and received by the Michigan State College Library, East Lansing, by inter-library loan.
3. Tabulating data from the correspondence files of the Michigan State College Entomology Department.

4. Consulting records of the Michigan State Department of Agriculture, Lansing; Michigan State

Department of Public Health, Lansing; and the United States Bureau of Entomology and Plant Quarantine Forest Insect Laboratory, Milwaukee, Wisconsin.

5. Oral communications and written correspondence with State and Federal agencies, representatives of commercial manufacturers of pesticides and pesticide application equipment, personnel of several Michigan chambers of commerce, contemporaries of former teachers of entomology at the Michigan Agricultural College (presently Michigan State College), present scientific workers at the College, Michigan libraries, the Milwaukee Public Library, Milwaukee, Wisconsin, and other organizations and individuals.

The foundations of the scientific study of entomology in Michigan were established in 1837 when the State Legislature authorized a State Geological and Biological Survey. In 1850, the Michigan State Agricultural Society requested the Legislature to establish an agricultural college and recommended that "insects and their habits" be among the things studied. In 1855, an agricultural college (presently Michigan State College) was established at Lansing and its operation began in 1857. Entomology was first taught at the Michigan Agricultural College in 1858. A chronological account of the teaching of entomology at the Michigan State College since 1858 is presented. The teaching of entomology elsewhere in Michigan is also discussed. An assay of the biographies of former students of entomology at the Michigan State College shows that many of these students have made noteworthy contributions to the field of entomology.

Organized interest in the collection of insects in Michigan began in 1837 with the establishment of the Geological and Biological Survey. Details are given about insect collections and surveys since that time, including the size and content of the collections of some amateur entomologists and the size and content of insect collections in Michigan colleges and museums.

Cooperative pest survey and control programs, undertaken by local, State, and Federal organizations, have played an important role in the development and application of entomology in Michigan. Extensive programs have been conducted for the Japanese beetle, European corn borer, grasshoppers, chinch bug, Oriental fruit moth, forest insects, flies, Rocky Mountain spotted-fever tick, and mosquitoes.

The first recorded agricultural chemical pest control in Michigan occurred in 1868. Developments in the chemical control of pests in Michigan since that date have been traced. The development of spraying and spray equipment since 1883 is illustrated pictorially. The history of legislation for the regulation, sale, and transportation of pesticides in Michigan, the entomological activities of the Michigan State Bureau of Plant Industry, Lansing, historical notes about some manufacturers of pesticides and application equipment, and miscellaneous notes on entomology in Michigan are included in this work.

334 pages. \$4.18. MicA54-1634

THE DESIGN OF SIMPLIFIED EQUIPMENT FOR THE RAPID DETERMINATION OF THE MOISTURE CONTENT OF GRAIN AND FORAGE CROPS

(Publication No. 8502)

Gerald William Isaacs, Ph.D.
Michigan State College, 1954

Moisture content is commonly used as an index of the keeping quality of farm grain and forage crops. Farmers need a means of determining the moisture content of such crops in order to obtain the fullest benefit from the use of modern equipment and procedures for harvesting and curing farm crops. Equipment for determining the moisture content of farm crops on farms should be accurate, simple to operate, low in cost, and applicable to all the common hay and forage crops within a wide range of moisture contents.

Moisture content varies widely within individual lots of farm crops. This is particularly true of hay which is curing in the field. This non-uniformity in moisture content makes it important to obtain a representative sample.

Detailed studies were made of two methods of measuring moisture content, a direct oven method and an electrical resistance method.

Exhaust Oven Method. An oven which utilizes the heat from the exhaust gases of an internal combustion engine to dry samples of hay or grain was designed and tested. This oven mixes ambient air with the exhaust gases, which lowers the temperature of the gases and prevents burning of the sample. Samples of hay weighing 100 to 200 grams are dried in about seven minutes. Samples of grain are dried in about fifteen minutes.

Electrical Resistance Method. Studies were made of the effects of electrode pressure, electrode design and frequency of the measuring current upon the electrical resistance measurement of hay and grain.

Tests of resistance-type moisture meters indicated that a single reading taken on hay or grain is not a good index of the moisture content of the whole lot. When testing hay with a resistance-type meter, at least 25 readings should be taken and the results averaged in order to obtain a reliable indication of the moisture content of the whole field.

Recognizing that most farmers would not carry out such a laborious computation, an automatic averaging device was developed which gives a single indication of the average moisture content of a large number of samples. This device measures the average electrical conductivity of the samples and thereby indicates a close approximation of their average moisture content.

Other Methods Studied. Preliminary investigations were made on several other methods of moisture determination: a method involving the measurement of the pressure of the acetylene produced in the reaction between calcium carbide and the water in the sample, a specific gravity method, an oil-distillation method, a method involving the measurement of the

shearing force required to cut hay samples, and a method using wet and dry-bulb thermometers to measure the equilibrium relative humidity of grain. None of these methods were found to be as applicable to the problem as the resistance and oven methods.

214 pages. \$2.68. MicA54-1635

The total body water calculated for twenty cattle by the antipyrine technique was highly correlated, + .939, with the total body water determined by analyzing all body tissues for moisture.

95 pages. \$1.19. MicA54-1636

AGRICULTURE, ANIMAL CULTURE

BODY COMPOSITION AND CARCASS CHANGES OF YOUNG HOLSTEIN CATTLE

(Publication No. 8512)

George Harvey Wellington, Ph.D.
Michigan State College, 1954

Animal husbandmen improve the economic value of slaughter cattle by feeding for optimum growth and fattening. However, more information concerning the influence of age and fat on the individual carcass characteristics of growing cattle is needed to support production recommendations. In this study the affect of age increases and of three levels of nutrient intake on the amount of edible meat, carcass length and thickness, weights of individual muscles, and tenderness were analyzed.

Twelve Holstein bull calves and thirty Holstein heifer calves were randomized within the three feeding levels and slaughter ages which ranged from 16 to 80 weeks. The calves on the low feeding level consumed approximately 61 to 75 percent of the amount of T.D.N. consumed by calves fed on the medium level, whereas calves on the high level of feeding consumed approximately 125 to 139 percent of the T.D.N. consumed by the medium group. The feeds conformed closely to those in use by farmers following unusually good, average, and limited feeding practices.

Indirect methods of determining body composition in vivo can contribute useful information otherwise not obtained until slaughter. The accuracy of body water composition determined in vivo by intravenous injection of a known amount of antipyrine and measuring the degree of dilution of the drug in all body water was evaluated. The percentage of body fat was calculated from the amount of body water.

Cattle with greater T.D.N. intake had a higher dressing percentage, increased length and thickness of carcass and a larger ratio of edible meat to bone. Higher nutritional levels were associated with a smaller percentage weight of muscles in the carcass. The level of feeding tended to show no significant influence on tenderness.

As the cattle increased in age there were significant increases in length and thickness of the carcass and a larger ratio of edible meat to bone. Age showed no influence on dressing percentage and in general no consistent influence on percentage weight of muscles in the carcass. One muscle of the three observed became significantly less tender with age in the bulls and two muscles showed this trend in the heifers.

AGRICULTURE, FORESTRY AND WILDLIFE

SITE INDICATORS AND FOREST TYPES OF THE DOUGLAS FIR REGION OF WESTERN WASHINGTON AND OREGON

(Publication No. 8339)

Rudolf Willem Becking, Ph.D.
University of Washington, 1954

The plant communities of the Douglas fir region in western Washington and Oregon are divided into two large groups: the Sword Fern - Douglas Fir forest type group (PP) and the Salal - Douglas Fir forest type group (GP) according to the principles of the Braun-Blanquet school in phytosociology.

The classification of the Douglas Fir forest types is based upon data from 325 vegetation plots (20 x 20 m²). Distinction between these forest types is based upon differences in floristic composition of the present vegetation, and indicator species and species groups are selected for the characterization of each forest type.

Distinction is made between four physiographic subregions. Plant indicators characteristic for each subregion are listed. Both PP and GP type groups are represented in all subregions by one or more types (associations).

The PP-type group is characterized by dominance of Sword Fern (*Polystichum munitum*), deep loamy soils at lower parts of slopes with adequate seepage water supply, and brown-earth at all elevations and high site quality (172) (= site index value for Douglas Fir).

The GP-type group is characterized by dominance of Salal (*Gaultheria shallon*), sandy to gravelly soils well to excessively drained, lack of moisture supply in summer, podsol development at all elevations, and medium to low site quality (150-120).

In the PP-types are distinguished the Lowland type (PPa) (181) of highest site quality, the Montane type (PPm) (179), the Subalpine type (PPs) (153), the Wet type (PPw) (116) with imperfect drainage, the Willamette Valley type (Wh) (155), the Fog Belt type (Fogh) (174) and the Typical type (PPT) (178) on Vancouver Island.

In the GP-types are distinguished the Lowland type (GPc) (135), the Lichen type (GPcl) (88), the Madrono type (GPa) (139), the Montane type (GPM) (122), the Subalpine type (GPs) (95), the Willamette Valley type (Wp) (111) and the Fog Belt type (Fogp) (115).

High Site Indicators (181) are *Actaea arguta*,

Asarum caudatum, Adiantum pedatum, Melica subulata and Ribes lacustre.

Low site Indicators (135-121) are Chimaphila menziesii, Chimaphila umbellata, Hypopitys monotropa, Pyrola asarifolia, Pyrola picta.

Extreme Low Site Indicators (83) are Hemitomes congestum, Pleuricospora fimbriolata.

For the Puget Sound subregion these are (94) Allo-tropa virgata, Boschniakia hookeri, Mahonia aquifolia, Apocynum androsaemifolium, Pyrola dentata, Pinus contorta.

The Common Associates of the Douglas Fir with Constancy V and Fidelity V for the GP and PP-types are:

<i>Gaultheria shallon</i>	<i>Trientalis latifolia</i>
<i>Polystichum munitum</i>	<i>Trillium ovatum</i>
<i>Galium triflorum</i>	<i>Thuja plicata</i>
<i>Goodyera decipiens</i>	<i>Tsuga heterophylla</i>
<i>Mahonia nervosa</i>	<i>Vaccinium parvifolium</i>
<i>Rosa gymnocarpa</i>	<i>Viola sempervirens</i>
<i>Rubus vitifolius</i>	

The PP-types characterised by the High Site Preferential Species (fidelity IV, III) by dominance (25-100% cover of plot area) of:

<i>Polystichum munitum</i>	<i>Oxalis oregana</i>
<i>Acer circinatum</i>	<i>Tiarella trifoliata</i>
<i>Achlys triphylla</i>	<i>Vancouveria hexandra</i>

by presence of:

<i>Dentaria tenella</i>	<i>Ribes divaricatum</i>
<i>Dicentra formosa</i>	<i>Ribes sanguineum</i>
<i>Hydrophyllum tenuipes</i>	<i>Streptopus amplexifolius</i>
<i>Tellima grandiflora</i>	<i>Tiarella unifoliata</i>

The GP-types characterised by the Low Site Preferential Species (fidelity IV, III) by dominance (25-100% of plot area) of:

<i>Gaultheria shallon</i>	<i>Linnsaea borealis</i>
<i>Mahonia nervosa</i>	

by presence of:

<i>Amelanchier florida</i>	<i>Linnaea borealis</i>
<i>Campanula scouleri</i>	<i>Lilium columbianum</i>
<i>Corallorhiza maculata</i>	<i>Lonicera ciliosa</i>
<i>Festuca idahoensis</i>	<i>Pinus monticola</i>
<i>Festuca occidentalis</i>	<i>Pseudotsuga taxifolia</i>
<i>Hieracium albiflorum</i>	(no tree)
<i>Holodiscus discolor</i>	<i>Symphoricarpos albus</i>

The Montane Character Species for the PP and GP-types are:

<i>Abies amabilis</i>	<i>Rubus pedatus</i>
<i>Clintonia uniflora</i>	<i>Vaccinium alaskaense</i>
<i>Cornus canadensis</i>	<i>Vaccinium ovalifolium</i>
<i>Menziesia ferruginea</i>	

The Montane PP - Preferential Species are:

<i>Disporum smithii</i>	<i>Luzula piperi</i>
<i>Dryopteris linnaeana</i>	<i>Tiarella laciniata</i>
<i>Kruhsea streptopoides</i>	<i>Tiarella unifoliata</i>
<i>Listera convallaroides</i>	<i>Streptopus curvipes</i>

The Montana GP - Preferential Species are:

<i>Gaultheria ovatifolia</i>	<i>Pyrola minor</i>
<i>Pachistima myrsinites</i>	<i>Pyrola secunda</i>
<i>Pterospora andromedea</i>	<i>Xerophyllum tenax</i>

The Subalpine Character Species for the PP and GP-types are:

<i>Corallorhiza mertensiana</i>	<i>Vaccinium membranaceum</i>
<i>Rubus lasiococcus</i>	<i>Abies nobilis</i>

The Subalpine PP - Preferential Species are:

<i>Coptis laciniata</i>
<i>Pectiantia pectandra</i>

The Subalpine GP - Preferential Species are:

<i>Abies lasiocarpa</i>	<i>Castanopsis chrysophylla</i>
<i>Chamaecyparis</i>	<i>Carex ? rossii</i>
<i>nootkatensis</i>	<i>Calamagrostis sp.</i>
<i>Pedicularis racemosa</i>	<i>Lupinus latifolius</i>
<i>Penstemon nemorosus</i>	<i>subalpinus</i>
<i>Phyllodoce empetrifolmis</i>	<i>Arnica betonicaefolia</i>
<i>Sorbus occidentalis</i>	<i>Erigeron salsuginosus</i>
<i>Tsuga mertensiana</i>	<i>Rhododendron macrophyllum</i>
159 pages. \$1.99 MicA54-1637	

THE SHARP-TAILED GROUSE IN THE UPPER PENINSULA OF MICHIGAN

(Publication No. 8395)

Tony John Peterle, Ph.D.
University of Michigan, 1954

The Michigan Department of Conservation recognized the need for information regarding the ecology of the Sharp-tailed Grouse in 1934. This continued effort to obtain factual data which would serve as a basis for an intelligent management program was manifested in the sponsorship of this investigation. Field studies, centered at the Cusino Wildlife Experiment Station, Shingleton, Michigan, were initiated in the summer of 1951, and were terminated three years later.

The first portion of this report presents the classification of the species studied; its history in Michigan; a brief description of the areas studied; and a review of published writings concerning this species.

The evaluation and development of inventory techniques were primary objectives. Seven methods were tested: dancing ground count, by aerial and ground observation; cooperators' reports; collection of wing and tail specimens; hunting kill reports; nest and brood counts, using prison inmate labor and dogs; complete census drives; and checking stations during hunting seasons. The dancing ground count is believed the most practical method for determining population fluctuations.

A survey was conducted to determine what habitat produced high populations. Three square miles supporting varying population densities were analysed. The density of woody vegetation was the most

important factor limiting sharptail populations. Correlation coefficients suggested natural plant associations that could be developed to improve the habitat. The use of aerial photographs as an aid to management is discussed.

The most important management measure needed to maintain the existing sharptail habitat is a technique that will remove the woody vegetation that is closing the wild land openings. Two methods were tested: controlled burning, and chemical spraying. The need for more knowledge in applying the former technique was emphasized by a comprehensive study of a seven square mile controlled burn. It seems doubtful that burning will produce desirable results on peat and muck soils. Limited tests of chemical herbicides indicated that this type of habitat manipulation is not economically feasible. The opportunities to improve habitat by planting are rare. The growth properties of one herbaceous perennial (flat pea) was tested. An experiment designed to determine the effect of coniferous plantings on game populations was initiated in 1950. As it would primarily affect the sharptail, the design and progress are included.

Other aspects of sharptail ecology were recorded incidental to the major objectives. Data regarding the display behavior suggested that light intensity is the most important controlling factor. Territoriality was evident in the social organization on the dancing grounds. Observations of productivity include discussions of nesting, hatching, predation, and brood behavior. A live trapping program provided information regarding sex and age ratios, movements, flocking habits, and diseases. The cannon projected net trap was the most efficient method for trapping sharptail. A summation of food habits information collected since 1934 is included. A comparison of two types of habitat was made on the basis of crop analysis and intestinal morphology. The caeca and small intestine of one group were significantly longer, suggesting that a less nutritious diet was available.

Sharp-tailed Grouse management is not compatible with land use programs designed to produce high financial returns. The future of this species in Michigan is dependent on the decisions of the public land administrator. If the dollar and cents sign is used as the common denominator for all land use planning, the sharptail has no future. The actions of the public land administrator should reflect the desires and needs of the public. Unless the public demands an increase in the type of recreation the sharptail provides, the efforts to maintain this species must remain at their present state of inadequacy.

275 pages. \$3.44. MicA54-1638

THE EFFECT OF TRACTOR AND HI-LEAD LOGGING ON THE PHYSICO-CHEMICAL PROPERTIES OF SOME SOUTHWESTERN WASHINGTON SOILS IN RELATION TO NATURAL REGENERATION

(Publication No. 8366)

Eugene C. Steimbrenner, Ph.D.
University of Washington, 1954

The increase in tractor logging and resulting increase in skid roads in the Douglas fir region of the Pacific Northwest led to an investigation of the effects of tractor and hi-lead logging on the physical and chemical properties of the soil in relation to natural regeneration.

Nine areas of tractor logging, located in southwestern Washington, were selected for sampling. Five of the areas were logged by tractors and hi-lead. On each study area, the logged portion was adjacent to a stand of mature timber which was used as a control and had the same physiographic characteristics as the cutover. The timber, tractor roads, tractor cutover and hi-lead logging were sampled separately for physical and chemical soil analyses and natural regeneration.

A total of 370 undisturbed soil cores, to a depth of 3 inches, were obtained for physical analysis. On each study area, 10 soil cores were taken from the timber and tractor treatments and 20 cores from the hi-lead treatment. Soil permeability, bulk density and pore space distribution was determined for each sample in the laboratory. Thirty-two composite soil samples were collected to a depth of 6 inches for chemical analysis. The chemical analyses consisted of determinations of exchange capacity, acidity, content of organic matter and total nitrogen, available phosphorous and contents of exchangeable potassium, calcium and magnesium.

A total of 1150 milacre plots, established one chain apart on a regular grid, for the regeneration survey included 100 plots on each tractor area and 50 plots on each hi-lead area. On each plot, regeneration was tallied by species, number, age, height and vigor class. The stocking percentages by plots, total number of seedlings per acre and number of established seedlings per acre were computed for each treatment. The areal extent of tractor roads was computed from the number of plots that occurred in that treatment.

An experiment was conducted to determine the number of tractor trips necessary to compact the soil to its maximum under wet and dry soil moisture conditions. An HD20 tractor was passed one-way over an area of undisturbed mature timber 10 times. Soil cores were obtained initially and after each succeeding trip for physical determinations. The results showed that 4 trips over the soil reduced the permeability rate 80 percent and the macroscopic pore space 50 percent under dry soil conditions. One trip with the tractor under wet soil conditions was equivalent to 4 trips when the soil was dry.

The results from the physical analyses showed that tractor logging reduced the soil permeability

50 percent and decreased the content of macroscopic pores 23 percent when compared to the timber control. Most of this reduction occurred on the tractor roads which covered 26 percent of the tractor-logged area.

The chemical analyses showed a slight loss of soil nutrients on the tractor roads. The tractor cut-over and hi-lead treatments had slight increases in soil nutrients.

The natural regeneration was greatly affected by soil disturbance on the tractor roads. The stocking, by milacre plots, was reduced 20 percent on the roads which contained only one-third as many established seedlings as the cutover treatment. In addition, the seedlings on the roads were of poorer quality and showed less height growth than the tractor cutover or hi-lead treatments.

81 pages. \$1.01. MicA54-1639

STAND CONDITIONS AFFECTING FORM FACTOR IN TREMBLING ASPEN

(Publication No. 8417)

Henry Arthur Stoehr, Ph.D.
University of Michigan, 1954

The purpose of this study was to relate the variation of form factor (ratio of tree volume to volume of cylinder with breast-height diameter) for pure, unmanaged, even-aged stands of trembling aspen to age, density, and site quality, and to investigate the variation of individual tree form factor with respect to crown class. The importance of these relationships arises from the fact that form or taper of the tree is a component of tree volume and ultimately of stand volume.

Measurements were taken on 60 plots in aspen stands on the Huron National Forest, Michigan. The array of plots is representative of the range of site quality, age, and density encountered on this National Forest. Each plot consisted of 50 trees from which eight sample trees were selected at random. Two trees for each of the four crown classes were felled and stem analyses made on a total of 480 trees. Form factor was related to stand age, stand density index, and site index by means of a linear regression equation. Separate regression equations were computed for each crown class.

It was found that the stand variables, age, site, and density, acting together, resulted in a highly significant difference in the average form factor between stands. When these variables were considered as acting separately, no one or any combination of two variables had as much effect on form factor as the three of them acting in combination. However, when these three variables are considered as acting singly, it was found that site index showed the greatest effect, age less effect, and stand density no significant effect. As the variables increased in magnitude the average form factor decreased. The difference in form factor between dominant, codominant, and intermediate trees was very slight. In

spite of generally poor shape, the form factor for suppressed trees was significantly higher than the other three crown classes. The codominant trees were affected the least by the variation in stand conditions. The suppressed trees were affected the most.

It was concluded that the form factor of the codominant trees best represents the form factor attainable for aspen within the climatic zone represented. It was found that as long as stand height is one of the variables measured in forest inventory work, the site index need not be included as a variable. It was also found that the percentage distribution of crown classes undergoes a complete shift of emphasis as stands become older. The young stands consist mostly of suppressed and intermediate trees but the older stands have a preponderance of codominant trees. It is recommended that the codominant trees be favored in thinning operations because of their having a relatively high form factor and a rapid growth rate, together with their natural tendency to represent the greatest proportion of the older stands.

129 pages. \$1.61. MicA54-1640

TRENDS IN LAND USE AND OWNERSHIP IN CHEBOYGAN COUNTY, MICHIGAN, AS AFFECTED BY SOCIO-ECONOMIC DEVELOPMENT AND THE LAND DISPOSAL POLICY OF THE MICHIGAN DEPARTMENT OF CONSERVATION, WITH EMPHASIS ON LANDS SOLD TO PRIVATE OWNERS BY THE STATE OF MICHIGAN

(Publication No. 8420)

Edward Earl Sturgeon, Ph. D.
University of Michigan, 1954

The purpose of this study is to determine the trends in land use and in the State and private ownership balance in Cheboygan County, Michigan, as affected by socio-economic development and by the policies of the Michigan Department of Conservation in administering State properties. A broad description of the County and the population is presented, including social, economic, and political factors related to ownership and use of land.

The changes in total area devoted to agriculture, forestry, and recreation are indicated. The quality of lands in State ownership is described by classifying them according to Schoenmann's land types. Emphasis is placed on the uses, quality, and ownership characteristics of lands sold by the State of Michigan to private owners in Cheboygan County from 1936 to 1947 in order to evaluate the effectiveness of the policies of the Department of Conservation in selling selected tax-reverted lands to private owners.

The natural features of the County and the development of lumbering, agriculture, and recreation are described to provide a setting for the analysis of trends in ownership and land use. Change in population number, distribution by age groups, and shifting of residence according to changing land-use

patterns are indicated. Considerable space is given to local economy. The relative importance of agriculture, manufacturing, recreation, and forestry is discussed according to incomes produced and areas devoted to each rural land use. The relationship of the County economy to that of the region is developed and the effect on the County of down-state urban areas is pointed out. County government costs are enumerated for each function and compared with other selected counties in Michigan. Tax burdens are evaluated in terms of present tax delinquency.

More land is used for forestry and recreation than for agriculture. Lands used for agriculture increased to a high mark in 1945 when they comprised 30 per cent of the County area. By 1950 they had decreased to 27 per cent. Area devoted to crops and pasture declined while only farm woodlot area increased.

About 72 per cent of the County is forested. Approximately 50 per cent of the land area is devoted to growing trees for timber, an increase of 19 per cent from 1938. State forests comprise 38 per cent of this area and 12 per cent are in private ownership. Only a small area of either State or private forest lands are under intensive forest management.

The privately-owned area used for recreation has more than doubled since 1938, although it accounts for only 14.5 per cent of the County area at present. The 175,000 acres of State forests are used for hunting, fishing, camping, and other recreational uses in addition to timber and game production. State ownership increased in area by approximately 60,000 acres since 1938. About 30 per cent of the increase was comprised of lands variably suited for agriculture.

Of the 20,571 acres sold by the State to private owners from 1935 to 1947, 25.7 per cent are used for pasture, 18.6 per cent for growing and harvesting timber, 15.1 per cent for speculation, 10.9 per cent for hunting, and 9.4 per cent for farm woodlots. All percentages for lands used for summer residence, crops, rural residence, orchard, and unknown uses total 10.9 per cent. More than 58 per cent of the lands sold by the State are in the better land types. By correlating uses of these lands with land capability, it is carefully estimated that 84 per cent will remain in private ownership continuously, barring too intensive use, a change to an inappropriate use with respect to soil capability, or a severe depression.

355 pages. \$4.44. MicA54-1641

AGRICULTURE, PLANT CULTURE

THE EFFECT OF DIFFERENT PHOSPHATE CARRIERS AND LIME ON THE YIELD AND PHOSPHORUS CONTENT OF ALFALFA, BEANS, AND WHEAT

(Publication No. 8500)

Hugh Walter Hough, Ph.D.
Michigan State College, 1954

Rock phosphate, dicalcium phosphate, fused tricalcium phosphate, potassium metaphosphate, calcium metaphosphate and superphosphate were added to Miami sandy loam in greenhouse pots. Applications were made at two levels on limed and unlimed soil. Alfalfa, white pea beans, and wheat were used as test crops.

For alfalfa, these treatments, ranked from the highest to the lowest according to yields and total phosphorus removed in forage, were superphosphate, potassium metaphosphate, dicalcium phosphate, calcium metaphosphate, fused tricalcium phosphate, rock phosphate, and no treatment. Except where the alfalfa was treated with potassium metaphosphate and rock phosphate, lime (pH 7.2-7.5) caused lower yields for the first cutting and higher yields for the third cutting.

Bean and wheat yields on the limed soil ranked as follows: potassium metaphosphate, superphosphate, calcium metaphosphate, dicalcium phosphate, fused tricalcium phosphate, rock phosphate, and no treatment. The treatments which were unlimed gave more favorable results for fused tricalcium phosphate and calcium metaphosphate.

For all crops the concentration of phosphorus, in the part of the plant taken for yield, had no correlation with yield. This might not have been true for potassium metaphosphate which consistently produced the highest concentration of phosphorus in alfalfa and bean tissue but those data were not correlated separately with yields.

In the field, white pea beans were grown with 80 lbs. per acre total P_2O_5 supplied by each of the aforementioned carriers plus concentrated superphosphate. There were no significant differences in yield as affected by the differences in sources of phosphate. The effects of the 0, 1.5, and 3 tons of lime per acre were more consistent but still were not statistically significant though the 1.5 ton rate appeared to be the best.

Both greenhouse and field soil samples were extracted with Bray's Available extracting reagent as well as with Bray's adsorbed extracting reagent at two dilutions (1:10 and 1:50). With alfalfa and beans the latter method seemed to give nearly equal results for both dilutions when the amounts of phosphorus extracted were correlated with yields (0.5 or higher). No significance was obtained for a similar correlation of test results with the yield of wheat grain.

A significant negative correlation was obtained between the pH of field plot soil and the concentration of soil phosphorus using Bray's adsorbed method with the 1:50 dilution.

The acid in the Bray's available extracting reagent extracted large amounts of phosphorus from the soil fertilized with rock phosphate thus being the cause of a poor correlation with crop yields.

71 pages. \$1.00. MicA54-1642

INVESTIGATIONS ON THE CONTROL OF ROOT ROT OF CANNING PEAS

(Publication No. 8457)

Herbert Gordon Johnson, Ph.D.
University of Minnesota, 1954

Advisor: T. H. King

At present, root rot is a limiting factor in growing canning peas as evidenced in recent years by some pea crops which have been a total loss because of this disease. Furthermore, large areas of otherwise suitable land have been abandoned because of severe root-rot infestations.

Crop rotation, adequate soil fertility, the use of partially resistant varieties, and early planting have been recommended for the control of this disease.

The objectives of this research were to investigate additional methods of control and to obtain further knowledge concerning the effect of environment and inoculum concentration on disease development.

The fungus, *Aphanomyces euteiches* Drechs., has been found to be the most important cause of root rot of canning peas in Minnesota. Fields in which peas have been grown intensively are usually the most heavily infested.

A disease index was developed for evaluating the degree of root rot and soil infestation. This index was a numerical system in which healthy plants were rated 10 and plants killed by root rot were rated 100. Living plants having varying degrees of root rot were rated accordingly. This index was also used to determine the degree of soil infestation. Fields having an index of 10-30 were classed as safe while those having an index of 30-40 were considered questionable for planting. Fields having an index greater than 40 were considered hazardous.

Greenhouse tests were made to determine the degree of infestation of field soils. The results of these tests usually gave a true indication of the degree of root rot which could be expected in the corresponding fields the next season.

The importance of accurate field sampling of soil was determined by comparing tests of individual samples with mixtures of these samples. The degree of root rot of plants grown in the soil mixtures was similar to that of plants grown in the most heavily infested samples.

Reduction in root rot was obtained by using tile drainage, commercial nitrogen fertilizer, well-rotted organic matter, and rye green manure. In crop rotations where oats, soybeans, corn, alfalfa, or red clover preceded peas, no measurable effect occurred in the degree of soil infestation. On the other hand,

previous peas crops always increased the soil infestation.

The degree of root rot caused by *A. euteiches* was proportional to the inoculum concentration of dilution of infested soil.

A fungicidal soil fumigant (OS-1199, Shell Chemical Corporation) gave excellent control of root rot and greatly increased plant growth in preliminary experiments where it was mixed thoroughly with the soil.

A number of foreign plant introductions of *Pisum sativum* were found to be more tolerant than commercial varieties to root rot caused by *A. euteiches*. The ability of the foreign introductions to withstand root rot was apparently related to their tendency to produce new roots. 97 pages. \$1.21. MicA54-1643

INTERRELATIONS OF METHODS OF WEED CONTROL AND PASTURE MANAGEMENT

(Publication No. 8523)

Dayton Lawrence Klingman, Ph.D.
University of Nebraska, 1954

Advisor: Franklin David Keim

Many pastures are weedy and produce considerably less than their potential in palatable forage and the restoration of these weedy pastures is of great importance.

The methods of improvement of weedy pastures now include conservative grazing or complete protection for a time, mowing for weed control, and renovation. Since 2, 4-D (2,4-dichlorophenoxyacetic acid) has revolutionized weed control practices in some other crops its evaluation with the presently accepted methods of pasture weed control is important.

The investigation reported herein was planned to give information about the effects of weed-control treatments and grazing-management treatments upon vegetative composition, forage production and forage consumption in a weedy pasture.

The weeds of greatest importance in the "poor" pasture selected for study were: ironweed, *Vernonia baldwinii* Torr.; false boneset, *Kuhnia glutinosa* Ell.; hoary vervain, *Verbena stricta* Vent.; many-flowered aster, *Aster multiflorus* Ait.; annual ragweed, *Ambrosia artemisiaefolia* L.; hairy chess, *Bromus commutatus* Schrad.; and prairie triple-awn, *Aristida oligantha* Michx. The desirable grasses present were primarily bluegrass, *Poa pratensis* L.; with scattered stands of side-oats grama, *Bouteloua curtipendula* (Michx.) Torr.; sand dropseed, *Sporobolus cryptandrus* (Torr.) A. Gray; and big bluestem, *Andropogon gerardi* Vitman.

The plots that were plowed were reseeded to: brome grass, *Bromus inermis* Leyss.; intermediate wheatgrass, *Agropyron intermedium* (Host) Beauv.; and a warm-season grass mixture (big bluestem, switch-grass, *Panicum virgatum* L.; sand lovegrass, *Eragrostis trichodes* (Nutt.) Wood; and blue grama, *Bouteloua gracilis* H. B. K. Lag. ex Steud.).

The 2,4-D was greatly superior to mowing for perennial weed control. Mowing in either June or early July for three years reduced stands of perennial weeds about 35 percent, while one pound 2,4-D, ester per acre on the same dates reduced stands 70 percent, and plowing and reseeding (plus 2,4-D) reduced perennial weed stands 89 to 94 percent. The same trends were evident for annual weed control except that mowing in July approached the 2,4-D treatments in effectiveness. Individual weed species gave differential responses to treatments.

Differential grazing management did not significantly affect most individual species but when all were considered together the grazed-as-usual practice resulted in the most weeds, deferred-and-rotationally grazed had somewhat less and the protected areas had the least numbers.

With the reduction of number of weeds by weed-control treatments there resulted a large increase in basal density of desirable grasses and a smaller increase in weedy grasses.

The three-year average total production of vegetation on plots with weed control (excepting mowing) was 92 percent that of the untreated check indicating that other species compensated in production for the broad-leaved weeds removed by treatments. In the check 55 percent of the total production was broad-leaved weeds but only an average of 11 percent where weeds were controlled.

Weed-control treatments increased the amount of forage eaten. Consumption of vegetation on plots having weed control ranged up to 252 percent of the check with the grazed-as-usual management and up to 318 percent of the check when grazing was deferred to June 15 and rotationally grazed thereafter.

While more vegetation was eaten in plots having weeds controlled, there was also more desirable grass remaining at the end of the season (with some exceptions). In the grazed-as-usual management the plots given 2,4-D treatments had approximately 200 percent of the check remaining as aftermath, while reseeded plots had only 20 percent, and mowed only 68 percent. In the deferred-and-rotationally grazed management, plots sprayed with 2,4-D had 140 percent of the check remaining as aftermath, reseeded plots 118 percent and mowed 71 percent.

105 pages. \$1.31. MicA54-1644

CERTAIN PHYSIOLOGICAL AND MORPHOLOGICAL RESPONSES IN POTATOES AND ONIONS INDUCED BY MALEIC HYDRAZIDE

(Publication No. 8508)

Surapaneni Nageswara Rao, Ph.D.
Michigan State College, 1954

Detailed morphological and physiological aspects of the nature of maleic hydrazide (MH) induced sprout inhibition favorable for the commercial long time storage of potatoes and onions, were studied during a three-year period. A crop of potatoes was grown in 1952 and again in 1953 including 4 and 10 varieties, respectively, and MH at 2500 ppm (3

pounds per acre) was applied as a foliage spray at different stages during the development of each variety. Differences in varietal response to treatment were noted. Chippewa, Sebago, and Kathadin (1953 only) showed the least injury following early applications, 36 days (June 4) and 50 days (June 18) from planting in 1952; and 31 days (June 15) and 45 days (June 29) from planting in 1953. In contrast, Russet Burbank, Kennebec, Irish Cobbler and Triumph were very susceptible to injury from early applications as evidenced by the increase in number of deformed and small tubers, reductions in total yield, and yield of U.S. No. 1 tubers. Whereas varieties individually differed in response to treatments applied on the same dates from time of seeding, applications of the chemical at comparable stages of maturity gave similar results with respect to tuber injury, yield of tubers, and inhibition of storage sprouting. Significant reductions in total yield from all spray treatments were detected in 1952 where all were applied prior to six weeks of harvest. However in 1953, no significant reductions in total yield or yield of U.S. No. 1 tubers were noted with the ten varieties when MH was applied either on August 13 or 25, 41 days and 30 days, respectively, before harvest. Storage data for the ten potato varieties grown in 1953, indicated that satisfactory inhibition of sprouting resulted from a single preharvest foliar spray of 2500 ppm of MH applied on either July 13, July 31 or August 13, 1953. MH applied July 1, July 15 or August 4 in 1952 showed complete inhibition of sprouting at the apical regions of the tubers but some growth was evident on the basal parts. Tubers harvested from plants sprayed with 2500 ppm of MH applied July 1, July 15, and August 4, in 1952 and planted January 7, 1953 in the greenhouse remained sound but completely dormant for eight weeks, whereas non-treated tubers and those treated June 4 and June 18, 1952 grew normally producing profuse roots and large vegetative tops. Although no post-harvest chemical treatment, among the many tested was found effective in breaking the dormancy induced by MH in storage of potatoes or onions, field studies on 20 varieties of onions in 1952 showed that a preharvest application of 2,4-D (0.1%) following treatment with MH (0.25%) completely nullified the usual storage growth inhibitory influence induced by MH.

Externally sprout inhibition in potatoes was characterized morphologically by a loss of apical dominance and lack of growth in the apical buds because of inhibition of cell division. From detailed records of plant growth in the field, storage quality, and anatomical observations of sectioned meristems of sprout initials from potato tubers and root primordia from onion bulbs, it was found that treatment with MH resulted in depressing of differentiation of tissues in the buds and root primordia accompanied by a retardation of cell division.

Differences in the response of potato varieties to treatment with MH were described in light of data reported in other investigations for different varieties of crops treated with MH as well as possible antiauxin effects related to its growth-suppressing properties.

112 pages. \$1.40. MicA54-1645

**DOUBLE BACKCROSSING AS A POSSIBLE
METHOD OF DEVELOPING AN EARLY,
LARGE-FRUITED TOMATO**

(Publication No. 8496)

Charles Walkof, Ph.D.
University of Minnesota, 1954

Adviser: T. M. Currence

The possibilities of applying the double backcross method to tomato breeding were explored in regard to developing strains that could be used as parents for first generation hybrids or in pedigree breeding to combine the earliness and large fruit size characters.

The early, small-fruited Farthest North and the late, large-fruited Early Jersey varieties were used for the initial cross to develop reciprocal backcross lines. Two of the largest-fruited plants were selected from the Farthest North backcross and two of the earliest plants were selected from the Early Jersey backcross. These selections were selfed and also backcrossed with their respective recurrent parents. The progenies of the selfed and backcrossed selections were tested in comparison with their parents and the F_1 in twenty five replicated single plant plots.

Selecting for increased fruit size from the Farthest North backcross gave only partial success. The slight gain obtained suggests incomplete dominance for small fruit size in the backcross. Therefore some favorable advantages were obtained for selecting increased fruit size from a heterozygous progeny.

The earliness character was partially dominant in backcrosses to Farthest North. When selecting for this character from the Early Jersey backcross, however, the self selection progenies were later than the average of the parent backcross. The earliest plants may not have been selected and it was concluded that it would be desirable to depend on larger numbers of

selections than were used in this study to gain earliness in a character which is sensitive to the environment.

The combinations of earliness with small fruit size and lateness with large fruit size in the parents seem to be representative of most tomato varieties. This suggests a genetic basis for each combinations. The correlation data obtained from the generations studied seemed to agree in general with this relationship. They were mostly positive and approached significance. One selection from the Early Jersey backcross gave a negative correlation for time of ripening and fruit size. This was suggestive of a combination of earliness with increased size of fruit and was thought possibly due to crossing over. A similar performance for the selection when crossed with its recurrent parent as when selfed lends support to the suggested origin of the selection. The occurrence of such a selection implies that other cross-over type plants may be obtained and may provide the desired combinations, namely, earliness with large fruit size.

When selecting for the characters concerned in this breeding program, one character only was selected. As a result the unselected character tended to deteriorate. This suggested that selecting for an improvement in one character may have resulted in the selection of undesirable alleles of genes for the other character. Genetic linkage of the characters in the parent would be expected to give such results. Therefore it seems evident that selecting for the desired combination of characters might give more favorable results.

Quantitative characters such as time of ripening and fruit size tend to be variable in response to minor environmental changes. This is a disadvantage when selecting for the desired plant types. Therefore when selecting for these characters it is desirable to obtain as many selections as can be managed and to evaluate their progeny in replicated tests supplemented with accurate records on earliness and fruit size. 74 pages. \$1.00. MicA54-1646

ANATOMY

**A HISTOCHEMICAL STUDY OF THE SUCCINIC
DEHYDROGENASE ACTIVITY IN THE
PRE-NATAL AND POST-NATAL RAT HEART**

(Publication No. 8637)

William Gregory Cooper, Ph.D.
Columbia University, 1954

Histochemical localization of succinic dehydrogenase activity in tissue sections and analysis of

tissue homogenates showed a significant difference between the enzyme content of the ventricles and that of the atrium, the ratio varying during different stages of development.

Portions of the ventricles and atria from fetal, newborn and adult rat hearts were analyzed by methods employing tetrazolium salts to visualize sites and levels of succinic dehydrogenase activity.

Tissue homogenates were analyzed by a modification of the method of Perry and Cumming (1952).

The ventricles were found to have a higher level of succinic dehydrogenase activity than the atria. The ratio of ventricular to atrial succinic dehydrogenase increased with time: 1.4 in the prenatal heart to 2.2 in the adult heart. The atrial level of enzyme concentration seems to peak about the sixth day after birth with only a slight rise in concentration throughout the remaining post-natal life. The ventricular level rises quite rapidly during the first sixteen days of post-natal life after which time the rate of increase is more gradual. Subsequent increases in the V./A. ratio are due primarily to this increasing ventricular concentration. Analyses of portions of the left ventricle showed that it contains a slightly higher level of succinic dehydrogenase activity than the right ventricle.

Histochemical analysis by the technique of Rutenberg et al. (1953) showed the succinic dehydrogenase activity to be greater within the cardiac muscle fibers of the ventricle than in those of the atrium thereby substantiating the findings of the homogenate study. The intracellular localization of this enzyme plus other cellular constituents of cardiac muscle are described. The correlation between the intracellular localization of these metabolites in the different chambers of the heart at different ages is discussed with respect to their association with mitochondrial number and function.

44 pages. \$1.00. MicA54-1647

THE ANATOMY OF THE AUTONOMIC NERVOUS SYSTEM IN THE DOG

(Publication No. 8384)

Nicholas James Mizeres, Ph.D.
University of Michigan, 1954

This study presents a gross anatomical description of the autonomic nervous system in the dog, excluding the cephalic region, based on complete dissections of ten dogs. In each anatomic region, the plexuses, the sympathetic trunk, with its ganglia and branches, the collateral ganglia, the vagus nerves and variations are described and illustrated. The following findings may be emphasized:

The cranial cervical ganglion sends filaments to the arteries of the upper cervical region, to the vagus nerve, the thyroid gland, and is closely associated with the nodose ganglion. The vagus nerve and sympathetic trunk are fused in the upper and middle cervical regions but separate in the lower cervical region.

The heart receives a left ventromedial cervical, ventrolateral cervical and a dorsal cervical cardiac nerve. Fibers from the left recurrent laryngeal nerve also reach the heart. On the right, it receives a recurrent cardiac, two craniovagal, two caudovagal and stellate cardiac nerves. No cardiac fibers below the stellate ganglion were observed. The caudal cervical ganglion contributes to the cardiac nerves. The stellate ganglion sends rami communicantes to the sixth, seventh and eighth cervical, and the first,

second and third thoracic spinal nerves, including the vertebral nerve.

The vagus nerves enter the abdomen as the ventral and dorsal gastric nerves. In general, the ventral gastric nerve sends gastric fibers to the ventral surface of the stomach and anastomotic filaments to the sympathetic plexus on the distal branches of the left gastric artery. Hepatic fibers enter the liver and anastomose with the sympathetic plexus on the terminal branches of the hepatic artery. The dorsal gastric nerve sends fibers to the dorsal surface of the stomach and terminates by anastomosing with the celiaco-mesenteric plexus near the roots of the celiac and cranial mesenteric arteries. In one half of the specimens fibers from the dorsal gastric nerve were found passing through the gastrophrenic ligament to the liver.

The single thoracic splanchnic nerve, emerging from the thirteenth thoracic level, sends fibers to the adrenal gland, and terminates in the splanchnic ganglion, which is connected to the celiac and aorticorenal ganglia. The first and second lumbar splanchnic nerves enter the splanchnic, aorticorenal and cranial mesenteric ganglia. The third and fourth lumbar splanchnic nerves enter the intermesenteric plexus and gonadal ganglia. The fifth lumbar splanchnic nerve enters directly the caudal mesenteric ganglion. Splanchnic fibers from the sixth and seventh levels were variable as to location and course.

The hypogastric nerve, emerging from the caudal mesenteric ganglion, anastomoses with the pelvic nerve to form a ganglionated network, the pelvic plexus, which sends fibers to all the pelvic organs. The hemorrhoidal part of the pelvic plexus sends direct fibers to the rectum and anastomotic filaments to the sympathetic plexus on the hemorrhoidal vessels. Fibers were not observed with certainty entering the adventitia of the iliac vessels.

The sacral sympathetic trunk sends rami communicantes to all the sacral spinal nerves and fibers to the middle sacral artery. No "ganglion impar" could be distinguished.

80 pages. \$1.00. MicA54-1648

VARIATIONS IN THE BRONCHOVASCULAR PATTERNS OF THE LEFT LOWER LOBE OF FIFTY LUNGS

(Publication No. 8480)

Martha Pitel, Ph.D.
University of Minnesota, 1954

The purpose of this study has been to determine the patterns assumed by the pulmonary vessels of the left lower lobe. Because these are largely determined by the bronchial patterns, the latter had to be analyzed also.

Fifty lobes obtained from the lungs of cadavers were dissected in the following order: 1) exposure of structures underlying the mediastinal surface; 2) separation of superior and basal segments; 3) exposure of basal veins by lateral reflection of the

medial basal segment; 4) dissection of basal artery and branches; 5) opening of bronchial tree for measurement of keels.

At each stage drawings were made. The data thus obtained were assembled in tables. Patterns which occurred most often were considered to be prevailing patterns. Then trends of variation and major differences between right and left lower lobes were established. Finally, features were noted that might complicate surgical resection of various segments.

Summary of bronchial patterns. The left lower lobe bronchus arises at a higher level than the right. Its first branch, the superior segmental bronchus, divides prevaillingly (43%) into medial and combined superior and lateral rami. Because of its invasion of the lower paravertebral surface, the superior segment caps the lobe obliquely. Dual origin of its trunk (1%) is much rarer than in the right lung (6%).

Subsuperior bronchi occur less frequently (27%) than on the right (61%) and are characteristically posterolateral in distribution. Therefore this portion of the subsuperior zone is frequently supplied by the highest branch of the lateral basal bronchus. The basal trunk bifurcates prevaillingly (62%) into anterior-medial basal and posterior-lateral basal trunks. The anterior basal bronchus is the most variable of the four basals, its lateral ramus being assisted or replaced by subsuperiors in 35 per cent of specimens. The lateral basal bronchus is absent in 11 per cent.

Summary of arterial patterns. Usually the superior segmental artery originates from the the pulmonary artery above the level of the lowest upper lobe artery. As a result of this overlap, the superior and

the basal must be ligated separately in left lower lobectomies. Multiple arteries to the superior segment occur in 36 per cent of left lower lobes as against 20 per cent in the right lobe.

The artery to the basal segments divides unevenly into a posterior basal and three other basal arteries (46%). Because of this group the lateral basal artery often arises from the deep side of the medial basal or the lateral basal stem (22%), and therefore may be ligated unwittingly in resection of anterior basal or medial basal segments, with consequent loss of respiratory surface. Finally, in two-thirds of the specimens the basal artery has a different mode of branching than the associated basal bronchus.

Summary of venous patterns. The left lower lobe is drained by the inferior pulmonary vein. The latter is formed by the confluence of a superior and a common basal vein. Unlike its associated arteries the superior vein is always a single vessel and usually has two principal tributaries (66%). In 20 per cent its intersegmental branch was absent, thus increasing the difficulty of separating superior from basal segments.

As in the right lung the common basal vein receives two principal tributaries, a superior basal and an inferior basal vein. However the composition of the two vessels differs on the two sides. Prevaillingly, on the left (46%) the upper vein is formed by the anterior basal, and the lower vein by the lateral basal and posterior basal veins. On the right (44%) both the upper and lower veins are formed prevaillingly by two tributaries, for the lateral basal vein is split and contributes to each.

83 pages. \$1.04. MicA54-1649

BACTERIOLOGY

ROLE OF ANTIBIOTICS IN THE NUTRITION OF THE RAT AND CERTAIN BACTERIA

(Publication No. 8479)

Glen Ervin Peterson, Ph.D.
University of Minnesota, 1954

I. Animal Growth and Intestinal Flora

A study was made of the effects of oral and parenteral administration of antibiotics on the growth, intestinal microflora and nutrition of weanling rats fed purified vitamin B₁₂-deficient diets. Dextrin as the sole dietary carbohydrate supported better growth than sucrose. Supplementation of the basal diets with aureomycin was stimulatory to growth; the addition of vitamin B₁₂ was even more beneficial, while both substances had a nearly additive effect on growth.

Parenterally administered aureomycin and bacitracin and orally administered aureomycin,

penicillin and terramycin significantly stimulated the growth of rats fed vitamin B₁₂-deficient diets. The injection of terramycin, penicillin, heat-inactivated penicillin and alkali-inactivated aureomycin, and the oral administration of bacitracin, inactivated penicillin and inactivated aureomycin had insignificant effects on growth.

Aureomycin did not enhance the growth of rats when casein was substituted for a soybean protein in a "complete" purified diet. The omission of folic acid from either the antibiotic-supplemented or the control casein-containing diet did not retard growth.

In general, animals which demonstrated the most significant weight increases over control animals showed the most efficiency in food utilization.

In addition to influencing growth, dietary carbohydrate and the various antibiotics had marked effects on the intestinal microflora. This effect was particularly noticeable within the enterococcus, lactobacillus, proteus, clostridium and drug-fast groups of bacteria, differing between the ileum, cecum

and colon. In most cases, the coliforms, antibiotic-resistant bacteria and proteus were more numerous in the intestines of those rats fed diets which supported the best growth. Antibiotic supplementation decreased the number of intestinal lactobacilli, except when dextrin was the dietary carbohydrate.

These experiments indicate that the growth stimulating properties of antibiotics and dextrin may be a result of their effects upon the intestinal microflora, e.g., an increase in the synthesizing species and/or a decrease in potentially harmful bacteria. The possibility that antibiotics may serve as nutrilites was not ruled out, although the "inactive" antibiotics did not appear to function in such a capacity.

II. Effects of Aureomycin-Resistance on Fecal Lactobacilli and *Escherichia coli*

Coliforms, enterococci and lactobacilli isolated from the feces of rats fed aureomycin were more resistant to this drug than isolates from control animals. Sub-lethal concentrations of the antibiotic actually stimulated, *in vitro*, the growth of some of the lactobacilli. A semisynthetic medium, capable of supporting excellent growth of the lactobacilli was developed. In this medium, low levels of aureomycin partially replaced the need of several of the isolates for certain B-vitamins. Upon inducing aureomycin resistance in one of the lactobacilli, no detectable nutritional changes occurred. Although the morphological aberrations that occurred during the development to drug-fastness were reminiscent of L forms of bacteria, no viable elements were detected in culture filtrates.

Upon the development of aureomycin resistance, a strain of *E. coli* absorbed much less vitamin B₁₂ per unit weight of cells from a medium containing high concentrations of aureomycin than from an antibiotic-free medium. Aureomycin had little effect on the ability of resting cells or cell-free extracts of the drug-fast strain, or its aureomycin sensitive parent, to oxidize pyruvate or glucose.

The results of this *in vitro* study suggest that the development of a drug-fast intestinal flora, *in vivo*, may be accompanied by changes in the physiology of the surviving organisms which, in turn, affect the nutritional well-being of the host. The stimulatory effect of sub-lethal amounts of aureomycin on the growth, *in vitro*, of certain lactobacilli may bear upon the "nutrilite theory" of antibiotic action in animals.

172 pages. \$2.15. MicA54-1650

CLOSTRIDIUM SPOROGENES AND RELATED PROTEOLYTIC ANAEROBIC BACTERIA

(Publication No. 8795)

William George Roessler, Ph.D.
Indiana University, 1950

Summary

Morphological, physiological, and serological studies have been made on a large group of mesophilic putrefactive organisms related to the anaerobic species, *Clostridium sporogenes*, in order to characterize the species and to determine relationships existing between the species comprising the "sporogenes group". *C. sporogenes* has been shown to be antigenically complex; at least twelve different groups were demonstrated by the flagellar agglutination technique. Physiological differences were observed among strains of *C. sporogenes* with respect to carbohydrate fermentations; a correlation between physiological activity and antigenic complexity established.

The heat resistant culture of the canning industry known as "No. 3679" was shown to be a strain of *C. sporogenes*. Most of the mesophilic putrefactive cultures isolated by the canning industry from spoiled foods were shown to be *C. sporogenes*.

An antigenic relationship between *C. sporogenes* and *C. paratuberculosis* was observed when the heat stable (somatic) antigens were employed in agglutination experiments. However, no common heat labile (flagellar) antigens were found in the two species. No differentiation between toxic and non-toxic strains of *C. paratuberculosis* was possible by agglutination techniques alone.

C. tyrosinogenes was shown to be related to *C. sporogenes* by agglutination techniques; however, this relationship was not observed with all strains of *C. tyrosinogenes*.

C. flabelliferum was not shown to be related antigenically to *C. sporogenes*, although the species are similar morphologically, physiologically, and culturally.

No cross agglutination was observed between *C. sporogenes* and *C. bifermentans* or *C. histolyticum*.

148 pages. \$1.85. MicA54-1651

BIOLOGY - GENETICS

THE EFFECTS OF X-RAYS ON THE FECUNDITY AND FERTILITY OF DROSOPHILA ROBUSTA FEMALES

(Publication No. 8513)

Murvel Eugene Annan, Ph.D.
University of Nebraska, 1954

Adviser: Dwight Dana Miller

This problem was designed to measure certain of the effects of X-rays on Drosophila robusta females. The experimental variables were treatment (X-irradiation), age (age of the female at the time of treatment), and days (days following treatment). The effects were observed on fecundity (the number of eggs laid) and fertility (Proportion of eggs cultured to complete the stage of development under consideration). The treatments used were 0 (controls), 2,500, and 5,000 roentgen units of X-rays. Groups of 10 or 17 day old virgin females were exposed to these doses. There were 10 females in each group. Immediately following treatment, each female was placed in an individual vial with two active males and for 20 days the eggs were collected, counted, and cultured.

All groups of young females consistently, though non-significantly, out-produced the corresponding groups of old females.

Individual day to day variation was the rule for fecundity. The possibility that this was partially due to ovarian rhythms was discussed.

The non-treated control series displayed a generally linear increase in fecundity for the 20 day observation period. There was no evidence that a peak in productivity was reached. A similar increase was observed in the females receiving 2,500 r units X-radiation with a suggestion of an initial stimulatory effect, then a reduction followed by a general increase. The 5,000 r treated females also displayed this suggestion of an initial stimulatory effect followed by a reduction in productivity. The general increase which was noted for the 2,500 r series was not evident in the 5,000 r series. The demonstration of such an initial stimulation of fecundity by X-rays was not conclusive in this experiment.

The 5,000 r X-raying unquestionably reduced fecundity. Even though total egg production was reduced by the 2,500 r treatment, this reduction was considerably less than 1/2 as great as that for the 5,000 r treatment. This lack of a linear relationship between dosage and reduction in fecundity is consistent with the findings of Gowen and Stadler (1952).

On the 21st day of the experiment, the females were dissected and their ovaries examined. The ovaries of females which had received 5,000 r

X-radiation were considerably atrophied. There were no detectable differences between the ovaries of females receiving 2,500 r X-rays and the untreated controls. Neither were there any detectable differences between the old and young females treated alike.

Since the experiment had been planned in part after the work of Yanders (1954), who exposed D. robusta males to X-rays, certain comparisons were made. Observations on egg hatch indicated a generally higher rate of X-ray induced dominant lethals in females than in males. This seems to be consistent with the findings of other workers using different species of Drosophilas. Whereas in males there was a greater rate of induction of dominant lethality in the old flies compared to the young ones, there was no such effect of age when females were the treated parents. The reasons for these differences between males and females in the effects of X-rays are not known.

In this experiment, and in that of Yanders, it was noted that in all groups a large proportion of the offspring died during the larval stage (mortality was as high as 65 percent). Mortality during pupation was very low.

Treating females with 5,000 r units X-rays considerably reduced fertility — even sterilizing many of the females. The reduction of fertility (as measured by egg-hatch) was nearly proportional to the dosage. The 2,500 r series had a reduction of fertility nearly 1/2 as great as that of the 5,000 r series. This was true, however, for the first 10 day period of observation only. From then on, variable recovery was exhibited. 87 pages. \$1.09. MicA54-1652

A STUDY OF THE INHERITANCE OF CERTAIN CHARACTERS IN A CROSS OF TWO FLAX VARIETIES AS EXPRESSED IN POPULATIONS SPRAYED WITH 2,4-D

(Publication No. 8444)

Robert Elroy Bothun, Ph.D.
University of Minnesota, 1954

Advisor: Dr. J. O. Culbertson

An investigation was made to study the inheritance of certain characters as expressed in genetic populations sprayed with 2,4-dichlorophenoxyacetic acid (2,4-D) and to determine the feasibility of breeding improved varieties of flax tolerant to 2,4-D. The populations studied consisted of the parents, F_1 , F_2 ,

F₃, and backcrosses to both parents sprayed with 2,4-D and of the unsprayed parental checks of the cross of B5128 x Redwing. Spraying was done approximately one month after sowing with an amine formulation of 2,4-D at the rate of 6 ounces acid equivalent per acre.

As compared with the sprayed B5128 parent, the sprayed Redwing parent expressed a greater degree of stem curvature and took a longer time to recover from curvature, but was delayed less in reaching full bloom and was not hindered in the normal development of plant height. The delay in maturity was essentially the same in both parental population sprayed with 2,4-D. The means of the sprayed parents differed significantly from each other for each of the characters studied. Evidence of segregation was shown by the greater variation in F₂ and F₃ for each character.

As expressed by stem curvature reaction to 2, 4-D appeared to be rather simply inherited with phenotypic dominance lacking. Multiple factors apparently conditioned reaction to 2,4-D on the basis of both days to recovery from stem curvature and days to full bloom with phenotypic dominance probably lacking in each case. The parents apparently differed by multiple factors conditioning maturity with only a slight tendency toward partial dominance of later maturity. The manner of inheritance of reaction to 2,4-D expressed by plant height did not appear to be too complex. Phenotypic dominance was lacking.

The average coefficient of correlation between stem curvature and days to recovery from curvature of .500 was significant. Although the degrees of association were low in F₂, both stem curvature and days to recovery were significantly correlated, positively with plant height at the time of spraying and negatively with full bloom, maturity, and plant height at maturity. The low inter-generation correlation coefficients between F₂ and F₃ of .299 and .162 for stem curvature and days to recovery, respectively, indicated that selection as early as F₂ for reaction to 2,4-D expressed by these characters would not be very effective. Since all correlation coefficients were small in magnitude, it seemed possible that segregates combining the smaller degree of stem curvature and fewer days to recovery of B5128 with the earlier full bloom and maturity and lack of effect on plant height of Redwing could be obtained without great difficulty. 34 pages. \$1.00. MicA54-1653

A MONOSOMIC ANALYSIS OF REDMAN WHEAT FOR STEM RUST RESISTANCE

(Publication No. 8446)

Allan Barrie Campbell, Ph.D.
University of Minnesota, 1954

Major Advisor: Chas. R. Burnham

A study was undertaken to determine the chromosome on which the gene responsible for the adult-

plant stem-rust resistance of Redman wheat is located. H-44-24, a sister selection of Hope, is the ancestor from which this character was inherited.

Redman was crossed with the twenty-one different monosomics in Chinese Spring wheat. Monosomic plants were selected cytologically for the original crosses and in the F₁ generation.

The first test of the F₂ segregation, involving only eighteen of the monosomics, was made in the field in 1952. This material was inoculated with a mixture of the common races to which Redman has mature plant resistance. Unfortunately there was a severe natural epidemic of race 15B, to which all of the plants were susceptible, and the classification of plants for resistance to the common races was difficult and not very reliable as an indication of the genotype.

A second test of the F₂ segregation, including all of the monosomics, was made in the greenhouse in 1953. This material was inoculated with race 56 of stem rust. Although a slight admixture of race 15B was unavoidable, the resistant and susceptible plants appeared to be readily distinguishable.

In both tests the data approached a ratio of nine resistant to seven susceptible plants, with the exception of chromosomes III and V, which approached a three to one ratio. There was, however, an inexplicable tendency towards an excess of susceptible plants in many of the F₂ populations.

It was tentatively concluded that two complementary factors are involved in the cross Chinese Spring x Redman, and that chromosomes III and V carry these factors. It was thought that the discrepancies in the data might have been the result of natural crossing in the F₁ generation. A check of these conclusions is now in progress.

35 pages. \$1.00. MicA54-1654

CYTOLOGICAL AND CULTURE STUDIES OF *Mesostoma ehrenbergii wardii*

(Publication No. 7968)

Charles Odert Hathaway, Ph.D.
University of Virginia, 1953

No Abstract 127 pages. \$1.59. MicA54-1655

ATTEMPTS TO ABET THE ACTION OF METHYLCHOLANTHRENE IN THE INDUCTION OF GASTRIC CANCERS IN MICE, USING DIETARY CHEMICAL ADDITIVES AND DIETARY DEFICIENCIES

(Publication No. 8498)

Claude Raymond Hitchcock, Ph.D.
University of Minnesota, 1954

Major Advisor: Owen H. Wangensteen, M.D.

Experimental work in the field of gastric cancer has been hampered by a lack of adequate animal

material. Our knowledge of possible factors responsible for the high incidence of gastric cancer in man might be increased if a method was found whereby we could induce, at will, adeno-carcinomas of the stomach in a small, short lived mammal. Especially would this be so, if the methods employed were reasonably physiologic, and by demonstrating circumvention of a protective mechanism in the animal, would possibly shed some light on a lack of similar mechanisms in the human.

It appears reasonable that, an increased knowledge of gastric carcinogenesis might lead to a measure of prevention of the disease. Strain specific mice were used in a series of experiments designed to aid or abet the action of a potent carcinogen upon the gastric glandular mucosa. Mice of the C3H, A, and dilute brown strain were used. The potent carcinogen selected for this study was methylcholanthrene, which was first synthesized from desoxycholic acid by Wieland and Dane.

The methods of possible abetment chosen for these experiments were as follows:

1. Addition of whole bile salts to the carcinogen containing diet.
2. The use of a physical factor, heat, and the chemical desquamator eugenol, in conjunction with carcinogen.
3. Effects of vitamin A deficiency coupled with action of the carcinogen.
4. Effects of vitamin B complex deficiency coupled with carcinogen.
5. Effects of a low protein diet as abettor of carcinogen action.
6. Addition of lysozyme as an enzymatic abetting factor.

Squamous cell carcinoma of the forestomach was common to all groups of mice ingesting methylcholanthrene. No adeno-carcinomas of the prepyloric stomach were found. A careful histologic examination of the glandular mucosa failed to reveal significant changes attributable to the carcinogen or abetting factors in combination with the carcinogen.

In experiment A (where whole fox chow plus methylcholanthrene was used) four sarcomas of the stomach were found. These cancers originated in the mucosa of the proventriculus and spread through the entire gastric wall. As far as can be determined, they are the first sarcomas to be produced by a simple feeding regimen.

Adequate control groups, free of carcinogen and exposed to the factors being studied as possible abetting agents, were established and were subsequently found to be entirely free of cancers. The most significant effects of hyperplasia and keratosis of the forestomach mucosa were noted in mice exposed to carcinogen, vitamin A deficient diet plus carcinogen, a vitamin B deficient diet plus carcinogen, the lysozyme plus carcinogen, and the low protein diet plus carcinogen. In the control groups, where carcinogen was not used, significant Papillomatosis and hyperplasia and keratosis were found in mice ingesting the vitamin A deficient diet only. It is interesting that other severe deficiency states did not lead to extensive squamous mucosal changes in these experiments.

Among mice ingesting both an abetting factor and carcinogen, hyperplasia and keratosis of the squamous mucosa was most marked in the group receiving lysozyme and methylcholanthrene. Also, the mice

ingesting a vitamin A deficient diet, a vitamin B deficient diet, and the low protein diet showed severe hyperplasia when these diets were added to the methylcholanthrene regimen. It appears that the prime factor in the hyperplasia and hyperkeratosis in mice under these experimental conditions is due to the methylcholanthrene itself, and that there is considerable abetment of this action by the above mentioned factors.

When vitamin A deficient diet, and a low protein diet were used in conjunction with methylcholanthrene, squamous cell cancers appeared at very early ages, this is in the nature of 60 days, as against 200 days for animals on methylcholanthrene alone. It seems likely that the low protein diet and the vitamin A deficient diet speeded up the action of methylcholanthrene significantly. The glandular portion of the mouse stomach resisted the mechanisms involved in these experiments as far as significant histological changes are concerned. It has been demonstrated that the forestomach of the mouse is susceptible to the action of methylcholanthrene by simple feeding techniques, and a high percentage of highly malignant squamous cell cancers can be produced.

175 pages. \$2.19. MicA54-1656

**STUDIES ON THE SUBSPECIES DROSOPHILA
MELANICA MELANICA AND DROSOPHILA
MELANICA PARAMELANICA**

(Publication No. 8529)

Leo Weeks, Ph.D.
University of Nebraska, 1954

Adviser: Dwight D. Miller

Studies were made on the morphology, geographical distribution, and isolating mechanisms of the two subspecies, Drosophila melanica melanica and Drosophila melanica paramelanica. Drosophila melanica was described by Sturtevant (1916), and Patterson (1943) subdivided the species into the subspecies mentioned above.

Patterson (1943) made the subdivision of the species chiefly on the basis of a difference in body coloration between the two groups. Drosophila melanica melanica tends to be darker in coloration than Drosophila melanica paramelanica. It is rather doubtful if this criterion is always useful in distinguishing members of the subspecies. There is probably no reliable external morphological characteristic known for distinguishing the two subspecies.

Miller (1944) observed a difference in the shape of the penis apparatus of the males of the subspecies. The lateral plates of the penis apparatus of Drosophila melanica melanica are more deeply incised than those of Drosophila melanica paramelanica. In these studies, a difference in the shape of the spermatheca of the females of the subspecies was observed. The shape of the spermathecal capsule in females of Drosophila melanica melanica is more pointed and rounded at the distal end than in females

of *Drosophila melanica paramelanica*. These are the only internal morphological characteristics known to differ in the subspecies. Otherwise, the subspecies are phenotypically similar.

Collections from wild populations were made in the vicinity of Lincoln, Nebraska, from May through July 1953 and again during September and October of 1953. Collections were also made in the states of Missouri, Illinois, Indiana, Kentucky, Tennessee, and Georgia during August and September of 1953. The subspecies were found to occupy for the most part definite geographical distribution areas, but they do overlap in a replacement zone. Both subspecies have been collected from Missouri, Nebraska, and Virginia. Only *Drosophila melanica melanica* was collected from Tennessee and Georgia, and only *Drosophila melanica paramelanica* was collected from Illinois, Indiana, and Kentucky.

Attempts were made to determine any ecological isolation which might exist between the subspecies. Possible breeding sites were observed, but no positive results were obtained. Both subspecies were readily attracted to banana-yeast bait. There was an indication that seasonal variation did have effects on the frequencies of the subspecies at different localities.

Attempts were made to obtain more information about the reproductive isolation of the subspecies. Hybrids were not obtained from reciprocal crosses between the different strains of the subspecies. Griffin (1942) obtained fertile hybrids between the subspecies, but the cross-fertility was very low,

usually less than 1%. There must be some reproductive isolating mechanisms between the subspecies.

Attempts were made to detect any hybrids which might have been produced in nature. No intermediate forms, either in external appearance or in the appearance of the internal morphological characteristics mentioned previously, were observed. Production of hybrids is less likely to occur in nature than in the laboratory.

The present studies suggest some uncertainty as to whether these forms should be considered as subspecies or separate species. Further studies on the ecological isolation and sexual isolation of the two subspecies would be particularly helpful to the problem of speciation.

46 pages. \$1.00. MicA54-1657

BIBLIOGRAPHY

- Griffen, A. B. 1942. Relationships in the melanica group. *Univ. of Texas Publ.*, No. 4228: 68-73.
- Miller, D.D. 1944. *Drosophila melanura*, a new species of the melanica group. *Journal of the New York Entomological Society*, vol. LII, March, 1944, pp. 85-97.
- Patterson, J. T. 1943. The Drosophilidae of the Southwest. *Univ. of Texas Publ.*, No. 4313: 166-168.
- Sturtevant, A. H. 1916. Notes on North American Drosophilidae with descriptions of twenty-three new species. *Ann. Ent. Soc. Amer.*, 9: 323-343.

BOTANY

APOMIXIS, POLYEMBRYONY AND RELATED PROBLEMS IN *TRIPSACUM*

(Publication No. 8786)

Lois Irene Farquharson, Ph.D.
Indiana University, 1954

The pattern of development in non-apomictic diploid *tripsacum*, from megasporogenesis to maturation of the fruit is described. It is similar to that of corn, but the rate is different, *tripsacum* requiring 4-5 weeks from pollination to maturation.

The occurrence of facultative apomixis of the pseudogamous type is sometimes close to 100% in certain races of tetraploid *tripsacum*. In apomictic fruits, early development of the caryopsis proceeds in the absence of endosperm. When pollination does occur, endosperm development may be normal or, occasionally, of a defective type.

Polyembryony with a frequency close to 50% has been found in certain races of the tetraploid. As far as is known, this is the highest frequency in the flowering plants where the origin of the extra embryo(s) is of the type described. Two megaspore mother-cells are sometimes present, giving rise to two embryo sacs. It is doubtful if meiosis always occurs. Within a single sac, some cell other than the egg (presumably a synergid) frequently gives rise to an embryo. As many as 4 embryos may be present in a single ovule, although no seed has been found to produce more than three seedlings.

Chromosome counts from 128 plants are reported. The somatic chromosome numbers are 36, 45, 54, 72, 90 and 108. Twin plants often have different chromosome numbers. The occurrence of largely tetraploid populations in the east may be explained by the failure of plants with chromosome numbers other than 72 to survive.

The records of collections of seeds and plants from 71 localities in 12 states are given, along with chromosome numbers when known, pollen viability (ranges from 0-100%) and frequency of polyembryony.

Successful crosses have been made by pollinating *tripsacum* with corn, teosinte with *tripsacum*, *T. dactyloides* with *T. floridanum* and various diploid and tetraploid races of *T. dactyloides* with one another. In the latter crosses, better seed set results when the diploid is used as the maternal parent. Embryo culture technique has been used to bring some of the embryos to maturity.

The variations in floral morphology which have been incidentally observed include: wholly staminate or pistillate inflorescences, bisexual spikelets, paired male and female spikelets, 3- to 5-flowered staminate spikelets, 2-flowered pistillate spikelets, pistils with multiple styles, paired female spikelets, false pairing of female spikelets, and branched lateral inflorescences.

Other aspects of the study which have been treated briefly include: the induration and color change in the rachis segments caused by an influence moving basipetally while in the glumes a similar effect is produced acropetally; parthenocarpy induced with naphthalene acetic acid; pseudo-embryos produced as a results of needle puncture or aphid injury; and the differences in various races in branching habit, rhizome development, etc. which are noted in connection with taxonomic considerations.

99 pages. \$1.24. MicA54-1658

A BIOSYSTEMATIC INVESTIGATION OF *HELIANTHUS GIGANTEUS* L. AND RELATED SPECIES

(Publication No. 8791)

Robert William Long, Jr., Ph.D.
Indiana University, 1954

An investigation of a small section of the genus *Helianthus*, whose species share a number of morphological characteristics in common, has been undertaken to clarify the genetic and systematic relationships of these species and to obtain information regarding their probable origins. This "giganteus" section is considered to include a minimum of seven species and six natural hybrids: *H. giganteus*, *H. californicus*, *H. grosseserratus*, *H. Maximiliani*, *H. Nuttallii*, *H. Parishii*, and *H. Rydbergii*, *H. X ambiguus*, *H. X divaricerratus*, *H. X filiformis*, *H. X intermedius*, *H. X Kellermani*, and *H. X luxurians*.

Mass collections were made of the two eastern species, *Helianthus giganteus* and *H. grosseserratus*. Generally, one species can be distinguished from the other by means of several characters, but two population samples contained putative hybrids and hybrid derivatives. A third population of *H. grosseserratus* varied in the direction of *H. giganteus* in regard to phyllary and leaf characteristics. A fourth population sample included specimens of *H. giganteus* that varied in the direction of *H. grosseserratus*, especially in leaf size and petiole length.

Hybridization experiments and chromosome studies have shown that a close genetic relationship exists between *H. giganteus* and *H. grosseserratus*. The F₁ generation was vigorous and appeared highly fertile. Backcross generations, also vigorous and fertile, resembled many of the variable individuals collected in two of the population samples. Chromosome behavior in microsporogenesis was normal in both F₁ and F₂ plants, except for occasional appearance of chains or rings of four chromosomes, and rarely univalents. Anaphase I configurations were regular, although lagging chromosomes were not infrequent. None of these abnormalities interferes to an appreciable extent with the formation of viable pollen grains in hybrids.

Many of the herbarium specimens which were examined showed the same wide variation and intergradation that had been observed in natural populations. Several specimens were remarkably similar to putative hybrids from the field collections and the artificial hybrids and backcrosses from the garden.

Information regarding the other species of the "giganteus" section was obtained from garden and herbarium investigations. Hybridization experiments demonstrated the interfertility of the species, with the formation of vigorous and apparently highly fertile F_1 generations. *Helianthus Maximiliani* has a wide distribution over much of central United States and Canada. *Helianthus Nuttallii*, with northern and southern subspecies, occupies territory in and adjacent to the Rocky Mountain region. *Helianthus californicus* occurs from California south to Baja California, Mexico. Thus, these species replace one another across the United States. *Helianthus Rydbergii* grows within the northern range of *H. Maximiliani*, and *H. Parishii* is endemic to southern California.

Some preliminary investigations were made to determine the relations of the "giganteus" sunflowers with morphologically unrelated sunflowers. A small collection of plants from near Fort Wayne, Indiana contained individuals of *H. giganteus* and *H. divaricatus*, with putative hybrids and derivatives. The artificial F_1 hybrid of the species was vigorous and exhibited normal chromosomal behavior during microsporogenesis. The natural hybrids have previously been referred to *H. ambiguus*. The so-called species *H. Kellermani* was shown to be a hybrid or hybrid derivative of *H. grosseserratus* X *H. salicifolius*. Artificial hybrids were also produced involving *H. mollis*, *H. "doronicoideus"*, *H. occidentalis*, and species of the "giganteus" section.

It was concluded that natural hybridization has played the most prominent role in causing variability and blurring species boundaries. At present, there is little to indicate that there are any effective kinds of internal barriers to hybridization. Isolation is mainly geographical and ecological; when the ecological barriers are removed, usually by man, hybridization takes place. The traditional morphological, geographical, and ecological criteria for separating species are applicable, although the intersterility criterion must be ignored. The probable evolutionary role of introgression in *Helianthus giganteus* and *H. grosseserratus* is the formation of biotypes capable of invading intermediate habitats. Ultimately, wide-spread introgression could lead to the formation of a large, polytypic series of populations with morphological combinations of both species. However, it appears that selective factors favor genetic combinations approaching the parental genotypes, for both taxa remain essentially distinct in nature.

133 pages. \$1.66. MicA54-1659

THE ORIGIN AND SIGNIFICANCE OF ANEUPLOIDY IN *CLAYTONIA VIRGINICA*

(Publication No. 8796)

Norman Vincent Rothwell, Ph.D.
Indiana University, 1954

Every haploid chromosome number from 6 through 18, as well as 24 and 36, has been found in *Claytonia virginica*. The various chromosome numbers are believed to have been derived from a basic haploid complement of 8. Numbers lower than 8 are thought to have arisen through processes involving chromosome breakage, segmental interchange, and loss of genetically dispensable material. In the origin of chromosome numbers higher than 8, it is suggested that several factors have been involved such as polyploidy, fertile triploids, non-disjunction, and the lagging and division of univalents.

Population analyses have shown that populations may be composed of plants having different chromosome numbers. Meiotic irregularities in individuals can account for the presence of the different numbers and suggest that chromosome numbers in these populations are continually changing. The extra chromosomes present in some populations appear to be isochromosomes or telocentrics resulting from the misdivision of univalents. *Claytonia virginica* appears to be somewhat unusual in its ability to tolerate supposedly unbalanced chromosome conditions.

Studies of somatic chromosomes have shown that several different karyotypes exist in *Claytonia virginica*. Karyotypes may differ between plants having the same chromosome number as well as between plants having different chromosome numbers. Individuals with the same chromosome number may have had very different genetic histories. Spontaneous chromosome breakage has been found in several plants and is believed to have been an important factor in the formation of the various karyotypes.

While a great deal of morphological variation occurs in *Claytonia virginica*, this variation appears to be dependent upon the interaction of genes present within a population rather than upon chromosome number alone.

Plants having different chromosome numbers have been crossed in various combinations, and viable seedlings have been obtained following some crosses. Examination of developing seeds has indicated that the endosperm may be an important factor preventing the appearance of numerous possible hybrids which could result from crossing plants of different chromosome number.

Studies of ovule and seed development have indicated that the main type of reproduction is sexual in plants with a haploid chromosome number of 8. No evidence for apomixis has been obtained in plants having the following haploid chromosome numbers: 8, 11, 12, 15, 16, and 18.

The evolutionary possibilities of *Claytonia virginica* would appear to be vast. The taxon may be a source for the origin of several new species which are not as yet fully differentiated.

213 pages. \$2.66. MicA54-1660

**GAILLARDIA PULCHELLA AND GAILLARDIA
ARISTATA: THE MORPHOLOGICAL AND
CYTOLOGICAL VARIATION AND THE TAXONOMY
OF THEIR WILD AND CULTIVATED RACES**

(Publication No. 8800)

Warren Petrie Stoutamire, Ph.D.
Indiana University, 1954

Gaillardia aristata and *G. pulchella* are the most widely distributed species of their genus, and the only ones of horticultural importance. The morphological and cytological variations of wild races of both species have been compared and described.

A haploid set of 17 chromosomes is present in the 19 races of *G. pulchella* and two races of *G. aristata* grown in the experimental garden. One race of the latter species from Colorado is tetraploid. A basic number of 18 has been reported for both species by other workers.

Herbarium specimens were examined in order to determine the amount of variation over the total ranges of the species. *Gaillardia aristata* is variable in characters such as plant height and stem color, but this variation is local, and is not correlated with any particular region. *Gaillardia pulchella* includes four types which are limited to definite parts of the species range. Each of these types merges through intermediates with neighboring forms.

Races of *Gaillardia pulchella* were experimentally crossed, and the meiotic configurations in the hybrids were examined. The observed irregularities consisted primarily of circles, chains, and unanalyzable groups of four chromosomes. These have been interpreted as the probable result of translocations of small chromosome segments. Chromosomal structure appears to vary over the species range, and seems to accompany morphological variation.

The species has been divided into subspecies which are morphologically fairly constant in any particular region. *Gaillardia pulchella* subsp. *pulchella* extends from central Nebraska to southern Texas, and from eastern Colorado and New Mexico to central Oklahoma and Texas. *Gaillardia pulchella* subsp. *picta* occurs in a narrow coastal strip from northern Tamaulipas to Louisiana and has recently been introduced to sandy areas as far east as North Carolina. *Gaillardia pulchella* subsp. *drummondii* occurs from south-central Oklahoma to south-central Texas, bordering the eastern edge of subsp. *pulchella*. *Gaillardia pulchella* subsp. *neomexicana* occurs in southern Arizona and New Mexico.

Gaillardia aristata and *G. pulchella* hybridized in Europe in the mid-nineteenth century, to produce the allotetraploid *Gaillardia X grandiflora*. This species has largely replaced diploid *G. aristata* as a cultivar. *Gaillardia pulchella* and *G. X grandiflora* are widely cultivated today, and each includes many horticultural varieties. Many of the cultivars popular in America were raised in the garden, and are shown to differ by minor characters which hardly warrant their continued separation. 'Indian Chief' and 'Lorenziana' (each with minor variants) are the only important cultivars derived from *Gaillardia pulchella*.

Eleven cultivars of *G. X grandiflora* grown in the garden are very similar to each other in most respects. 149 pages. \$1.86. MicA54-1661

**THE ETIOLOGY AND CONTROL OF FALSE SMUT
OF BUFFALOGRASS CAUSED BY
CERCOSPORA SEMINALIS**

(Publication No. 8530)

John Lawson Weihing, Ph.D.
University of Nebraska, 1954

Adviser: J. E. Livingston

A brief description of false smut of buffalograss, *Buchloe dactyloides* (Nutt.) Engelm., caused by *Cercospora seminalis* E. and E. was given in 1888 but since then very little has been reported. The disease is a serious retarding factor in obtaining seed production. The purposes of this study were to observe the infection phenomenon and the advance of the pathogen in the host tissues, to isolate the fungus and study its cultural characteristics, and to determine its means of overwintering and the action of certain factors relating to the control of the disease.

Histological studies revealed that hyphae of *C. seminalis* penetrate the stigma of an unfertilized ovary of buffalograss and grow intercellularly down the style and into the ovary. The pathogen replaces the ovary and completely fills the ovary cavity with a black stroma which contains numerous chlamydospores. A mass of indeterminate, branching conidiophores bearing conidia arises from the summit of the stroma and forms a black sphere one to two millimeters in diameter on top of the spike. Histological techniques for studying the disease were developed.

The spikes which have previously fallen onto the soil decay and release stromata which disintegrate, impregnating the soil with viable chlamydospores. Soil obtained in early spring from buffalograss plots and dusted onto stigmas caused 25 per cent of the ovaries to become infected. Under natural conditions wind and rain can easily carry contaminated soil to the stigmas which, in the presence of adequate moisture, would result in infection. In free moisture at 25° C., conidia began germinating in three hours and chlamydospores in eight to ten hours.

It was found that fertilization completely inhibited infection. This discovery led to the application of hormones for the control of the disease. In both greenhouse and field trials, 2,4-dichlorophenoxyacetic acid applied before pollination gave good control. The hormone did not seriously interfere with subsequent fertilization of the ovary, formation of seed or its subsequent germination.

The pathogen is easily isolated in pure culture and grows well but does not sporulate on ordinary nutritive media. On solid media the fungus produces a circular, black, leathery mat at the surface above which fluffy, grey or white aerial hyphae may or may not develop. Chlamydospores capable of living for at least several years in a dried state are produced

throughout the mycelium. Best growth was obtained at temperatures of 25 to 30° C. and H-ion concentrations of pH 5.0 to 6.0.

Sporulation was obtained by establishing colonies of the fungus on red clover or soybean tissue and

then permitting these to dry and age for several months after which they were implanted in fresh potato dextrose agar. Mycelial columns bearing spores arose from the resultant colonies.

129 pages. \$1.61. MicA54-1662

CHEMISTRY

CHEMISTRY, GENERAL

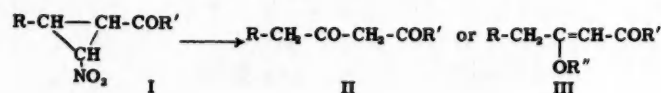
CYCLOPARAFFINS VIII: THE PREPARATION OF TWO 1-ACYL-2-NITRO-2,3,3-TRIMETHYLCYCLOPROPANES AND THEIR REACTION WITH ALKALIS

(Publication No. 8460)

William Lawrence Kohlhasse, Ph.D.
University of Minnesota, 1952

Major Adviser: Lee Irvin Smith

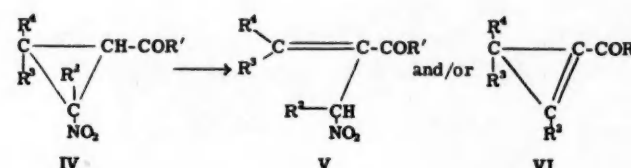
The first mechanism proposed for the cleavage of the ring in acylnitrocyclopropanes, by action of bases, was that suggested by Kohler and Smith (1). To account for the formation of 1,3-diketones (II) or their enol ethers (III) from compounds having the general structure I, they



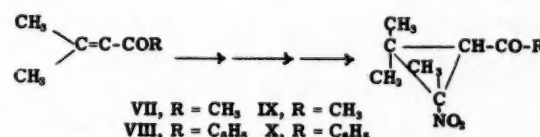
suggested that the first step in the reaction with bases consisted of the removal of the elements of nitrous acid giving a cyclopropene. This was then assumed to rearrange to an acetylene, which in turn added water or alcohol to give II or III, respectively. Smith and Engelhardt (2) showed that a more reasonable mechanism for the cleavage of compounds represented by structure I and, in general, those compounds having a hydrogen atom at the #2 position, began with an attack by the base anion upon the #2 hydrogen atom.

Showell (3) proposed that acylnitrocyclopropanes be divided into five classes, the division being dependent upon the location of the hydrogen atoms attached to the ring. Mechanisms, involving an electronic interaction between the nitro and carbonyl groups and the removal of a hydrogen atom attached to the ring, were proposed for the cleavage of some of the known classes. Showell suggested that the unknown acylnitrocyclopropanes (IV) with only one hydrogen atom (at the #1 position) attached to the ring (Class "C") would be converted to either an unsaturated nitroketone (V) or a cyclopropene (VI), or both.

The purpose of the research described in this thesis was the preparation of the first two known members of Class "C." The compounds prepared



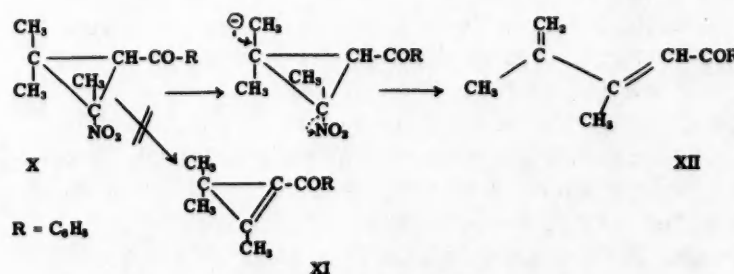
were 1-acetyl-2-nitro-2,3,3-trimethylcyclopropane (IX) and 1-benzoyl-2-nitro-2,3,3-trimethylcyclopropane (X). They were prepared from the two α, β -unsaturated ketones, VII and VIII, by reactions



analogous to those used by earlier workers in this field.

The action of bases upon IX and X gave two types of products; viz., base-insoluble, nitrogen-free ketones, and base-soluble, unsaturated nitroketones. Secondary condensation reactions made a study of the action of bases upon IX difficult, and attention was largely directed toward a study of the products obtained from X. The major component of the base-insoluble products obtained from X was found to be a dienone (XII), rather than the isomeric cyclopropene (XI) predicted by Showell. IX appeared to give the acetyl analogue of XII (R = CH₃), but it could only be isolated as the 2,4-dinitrophenylhydrazone.

It does not appear that XII could be formed from XI by action of bases. The most reasonable mechanism for the formation of XII would appear to involve the initial attack, by a base anion, upon a #3 methyl group in X as follows:



REFERENCES

1. E. P. Kohler and L. I. Smith, *J. Am. Chem. Soc.*, **44**, 624 (1922).
2. L. I. Smith and V. A. Engelhardt, *ibid*, **71**, 2671 (1949).
3. J. S. Showell, Ph.D. Thesis, University of Minnesota, 1951.

222 pages. \$2.78. MicA54-1663

CHEMISTRY, BIOLOGICAL

STUDIES ON ENZYMES INVOLVED IN
NUCLEIC ACID METABOLISM

(Publication No. 8617)

George Brawerman, Ph.D.
Columbia University, 1953

I. On the preparation of wheat germ desoxyribonucleic acid and its enzymatic degradation.

Desoxyribonucleic acid, entirely free of ribonucleic acid, was prepared from wheat germ. A chromatography solvent was found that allowed the separation on paper of the five nitrogenous bases present in this nucleic acid. Crystalline pancreatic desoxyribonuclease was found to split wheat germ desoxyribonucleic acid at the same rate as calf thymus desoxyribonucleic acid. After exhaustive treatment of wheat germ desoxyribonucleic acid with the enzyme, a non-dialysable residue was left. This residue showed the same variations in purine and pyrimidine composition as did the comparable residue from calf thymus desoxyribonucleic acid. It was concluded that the occurrence of such residues resistant to enzymatic cleavage is due to a specificity in the action of pancreatic crystalline desoxyribonuclease.

II. Enzymes from germinating barley attacking desoxyribonucleic acid and the action of barley desoxyribonuclease on desoxyribonucleic acid.

A desoxyribonuclease present in commercial malt diastase preparations was extracted and partially purified. The desoxyribonuclease, phosphodiesterase, phosphomonoesterase, and adenosine deaminase activities present in the purified preparation were studied. On prolonged digestion with the enzyme preparation, desoxyribonucleic acid was quantitatively converted to nucleosides. Under appropriate conditions the action of the contaminating enzymes was negligible, and the action of malt desoxyribonuclease on calf thymus desoxyribonucleic acid could be followed. The formation of a non-dialysable residue resistant to further desoxyribonuclease action was detected. This residue showed variations in purine and pyrimidine composition different from those produced by crystalline pancreatic desoxyribonuclease. It is suggested that the desoxyribonucleases from germinating barley and from pancreas differ in their specificity.

III. Enzymatic synthesis of mononucleotides by "low energy" phosphate transfer.

Malt and human prostate phosphatase preparations were found to be able to catalyze the transfer of phosphate from monophenylphosphate to nucleosides. With the malt preparation, the pH-activity curves for the phosphatase and the phosphotransferase reactions were similar; inorganic phosphate inhibited both reactions to the same extent; the extent of phosphorylation increased with the concentrations of both acceptor and donor; the ratio of phosphate transferred to inorganic phosphate formed ("phosphorylation ratio") remained constant with varying concentrations of donor, but varied with the acceptor concentration; indications of the existence of a cofactor were obtained. The ribonucleosides of adenine, guanine, hypoxanthine, cytosine and uracil, and the desoxyribonucleotides of adenine, guanine, hypoxanthine, cytosine, uracil and thymine were tested with the malt enzyme; with the prostate enzyme, only ribocytidine, riboadenosine and thymidine were tested. In all cases phosphorylation occurred. With the malt enzyme, only the 5'-nucleotides were formed; 5'-nucleotides acted also as highly efficient donors; ribose-5-phosphate was less efficient; the pyrophosphate group of adenosine triphosphate was inactive. With the prostate enzyme, the three ribonucleotide isomers and the two desoxyribonucleotide isomers were formed; nucleotides were inactive as donors. The possible role of the enzymes in nucleic acid biosynthesis is discussed.

72 pages. \$1.00. MicA54-1664

COMPARATIVE STUDIES OF THE CHEMICAL
AND PHYSICAL PROPERTIES OF
SOME CEREAL PROTEINS

(Publication No. 8449)

David Kenneth Cunningham, Ph.D.
University of Minnesota, 1954

Previous studies have shown that of the major components of wheat flour including starch, non-starch carbohydrates, lipids and proteins, the cohesive gluten proteins exerted the greatest effect on dough quality. Since the cohesive properties of these proteins might result from peculiarities of structure too subtle to be revealed by studies on wheat gluten alone, consideration was given to the preparation and study of analogous glutes from barley, rye, and oats.

Of the several possible procedures for isolating these proteins, the method of Lusena using dilute acetic acid appeared to be the most practical. Preliminary experiments had shown that if dilute formic acid were substituted for acetic acid and if the barley, rye and oat flours were subjected to a preliminary water extraction, substantial quantities of protein might be extracted by the dilute acid; moreover, the proteins of barley and rye could be recovered in a cohesive form by neutralization with saturated calcium hydroxide. Oat flour yielded only a clay-like non-cohesive protein.

Experimental work based on these preliminary experiments were formulated in five sections: extraction of proteins, properties of gluten precipitated

with dilute calcium hydroxide, precipitation of gluten by salts, precipitation by salts at various pH levels, and the effect of amides on the solubilities of the "glutens" of wheat, barley, rye and oats.

Extraction procedures involved a comparison of formic, acetic, oxalic and citric acids as extraction agents. Considerable variability in solubilizing power was shown by these acids; formic was selected for future experiments. Solubilization by mild agitation was compared with the use of the Waring Blendor and found to be inadequate; the shearing forces generated in the blendor appeared to be necessary for adequate protein solubilization.

Glutens prepared by precipitation from acid solution with saturated calcium hydroxide were examined for texture and physical behavior, nitrogen and amide nitrogen content and water absorbing characteristics. Wheat gluten was most elastic and cohesive, barley and rye proteins were cohesive but relatively inelastic while oat protein was entirely clay-like and exhibited only slight cohesive properties. In nitrogen content, the proteins were about equal and similar to washed-out gluten; in amide nitrogen content there tended to be a gradation with wheat gluten highest, barley and rye glutens intermediate and oat protein somewhat lower. In water absorbing capacity rye gluten was highest; wheat gluten was intermediate, and barley and oat glutens were lowest.

The precipitation of gluten by neutralization with calcium hydroxide suggested that solubility was a function of cation concentration. This was demonstrated by precipitation with salts of formic acid. Formates were more effective than chlorides and monovalent cations were more effective than bi-valent cations.

The precipitation of proteins by neutralization with saturated calcium hydroxide suggested that precipitation with salts at varying pH levels might indicate the means by which the glutens were solubilized. The pH levels were adjusted first by dialysis and more successfully, by treatment of gluten solutions with ion-exchange resins. Solubility curves indicated that precipitation was induced in part by displacement of hydrogen by the cation and in part by neutralization of electrostatic forces by cations.

The high proportion of amide nitrogen in the glutens suggested that hydrogen bonding between amide groups might contribute to their cohesive properties. This was supported by studies on the inhibition of precipitation with simple amides. High concentrations of urea and acetamide totally prevented wheat, barley and rye gluten from precipitating from formic acid solutions; a fraction of oat protein always precipitated.

107 pages. \$1.34. MicA54-1665

I: THE EFFECT OF CARBOXYPEPTIDASE
ON VARIOUS CRYSTALLINE PROTEINS
AND ITS RELATION TO THE
TRYPSINOGEN-TRYPSIN SYSTEM.

II: IDENTIFICATION AND CHARACTERIZATION
OF A PEPTIDE SPLIT FROM TRYPSINOGEN
DURING AUTOCATALYTIC ACTIVATION.

(Publication No. 8345)

Earl Warren Davie, Ph.D.
University of Washington, 1954

1. Trypsin and its zymogen, trypsinogen, have been investigated in an attempt to elucidate the changes which occur during the activation process. These proteins have been subjected to enzymatic attack by carboxypeptidase to determine possible C-terminal amino acids and correlate such data with the N-terminal groups previously determined by Desnuelle *et al.*

2. When carboxypeptidase is allowed to act on crystalline trypsinogen or on inactive, crystalline diisopropyl phosphoryl (DFP) trypsin, no hydrolysis whatsoever occurs. To further clarify these negative results, several other crystalline proteins were tested as substrates for carboxypeptidase. These have included the soybean trypsin inhibitor (STI), the soybean trypsin inhibitor-trypsin (STI-T) compound, β -lactoglobulin, α -lactalbumin, and pork, beef, and swine insulin. With these latter mentioned proteins, stoichiometric amounts of one or more amino acids were liberated in each case.

3. N-terminal analysis of the STI has shown that this protein is composed of a single polypeptide chain with an N-terminal aspartic acid (or asparagine). C-terminal analysis of the STI and the STI-T compound by carboxypeptidase have shown the same amino acids to be liberated in each case. These results indicate that trypsin in combination with STI or as a diisopropyl phosphoryl derivative is devoid of a C-terminal group reactive toward carboxypeptidase.

Thus, the trypsinogen-trypsin system appears to be somewhat unusual in its resistance to carboxypeptidase attack. The negative results suggest that no change occurs at the C-terminal end of the polypeptide chain during activation of the zymogen.

4. Since trypsinogen and trypsin have different N-terminal amino acids; i.e., valine and isoleucine respectively, the possibility of one or more peptides being split off the N-terminal portion during autocatalytic activation was investigated. Chromatographic evidence for such a peptide has been obtained. Hydrolysis of the peptide has yielded valine, aspartic acid, and lysine in mole ratios of 1:4:1. The N-terminal position of valine in both the peptide and DFP-trypsin has been established by the DNFB method. The C-terminal position of lysine is suggested by the specificity requirement of trypsin.

The acidic properties of the peptide were further demonstrated by paper electrophoresis and are in accord with the relative isoionic points of trypsinogen and trypsin; i.e., 9.3 and 10.1 respectively. A molecular weight of 705 for the peptide is in agreement with relative molecular weights of trypsinogen and

trypsin, the relative change in their extinction coefficients, and the difference in their free amino groups.

The significance of these findings are discussed and a proposed activation mechanism is presented.

73 pages. \$1.00. MicA54-1666

THE PARTIAL SYNTHESIS AND PHYSIOLOGIC STUDY OF SOME ANALOGS OF ADRENAL HORMONES

(Publication No. 8468)

Warren Francis McGuckin, Ph.D.
University of Minnesota, 1953

16,17-Epoxy-11-dehydrocorticosterone acetate and 11,16-bisdehydrocorticosterone acetate were synthesized from their 4,5 β -dihydro-12 α -bromo precursors. As these new compounds both possess the structural characteristics deemed necessary for the glycogenic properties of certain of the adrenal hormones, they were subjected to a study on the adrenalectomized male rat, both singly and in combination with cortisone acetate. Neither of these two analogs promoted deposition of glycogen in the liver, and when given simultaneously with cortisone acetate they did not appear to enhance or retard the effect of the latter on the concentration of liver glycogen.

During the development of procedures for the partial synthesis of the above compounds, the Mattox-Kendall procedure for the introduction of the 4,5-double bond in the "A" ring of steroids was modified to improve the previous procedure and to give good yields of the Δ^4 -3-keto steroids from their 4-bromo-4,5 β -dihydro precursors. The main changes in the procedure involved substitution of tertiary butyl alcohol for acetic acid, and of semicarbazide for 2,4-dinitrophenylhydrazine. The unsaturated semicarbazones formed as intermediates were then hydrolyzed under very mild conditions to give the desired Δ^4 -3-keto compounds in good yield. The reductive debromination of 12 α -bromo-11,16-bisdehydrocorticosterone acetate was achieved through the use of chromous chloride. This reagent in alcoholic solution proved to be very selective. Zinc and acetic acid could not be used for this reduction, except under very exacting conditions.

Modifications of the Pabst, Sheppard, Kuizenga technique for the bio-assay of glycogenic steroids gave a simpler, more precise method of assay. The steroid in suspension was given in one dose by intraperitoneal injection. The glycogen content of the liver was determined five hours following the administration of the test substance. This time was selected in order to make possible a count of the eosinophils present in the peripheral blood at approximately the same time that the liver glycogen determination was carried out. Indications are that a more sensitive method might be developed if the liver glycogen determinations were made 10-12 hours after injection of the steroid.

Additional steroids were tested in combination

with cortisone acetate for possible synergism, or antagonism as measured by the effect on the glycogen content of the liver. Among the compounds tested were, 6-dehydrocorticosterone acetate, 5 α -dihydrocortisone acetate, and 5 β -dihydrocortisone acetate.

6-Dehydrocortisone acetate was shown to be approximately 75% as active as cortisone acetate when each compound was tested alone. When mixtures of equal quantities of the two substances were tested, the liver glycogen content was only slightly lower than would be anticipated from the effect of the 6-dehydro component, and much lower than that to be expected from the effect of the cortisone acetate contained in the mixture. It appears that 6-dehydrocortisone acetate may inhibit in some manner the effect of cortisone acetate so that the net effect is that of 6-dehydrocortisone acetate only.

When 10 mg. of 5 α -dihydrocortisone acetate¹ was administered with 1.0 mg. of cortisone acetate the glycogen deposited in the liver of the test animal indicated that an inhibition of about 70% was obtained. The same experiment using 5 β -dihydrocortisone acetate indicated that 55% inhibition could be obtained with the latter compound.

It appears as a result of the present studies that slight modifications at carbon atoms 16 and 17 (in the "D" ring) of cortisone destroy its glycogenic activity. When a 16,17-double bond or a 16,17-epoxy group were introduced into the "D" ring the resulting compounds did not demonstrate any antagonism toward cortisone when measured by the liver glycogen deposition test. Reduction of the 4,5-double bond in the "A" ring of cortisone acetate, however, did result in the formation of cortisone antagonists, both the 5 α - and 5 β isomers being effective inhibitors under the conditions of the assay procedure.

79 pages. \$1.00. MicA54-1667

1. This compound was kindly furnished by Dr. Max Tishler of Merck and Company, Rahway, New Jersey.

STUDIES ON THE RELATIONSHIP BETWEEN PTEROYLGLUTAMIC ACID AND COENZYME A

(Publication No. 8374)

Edward M. Popp, Ph.D.
University of Arkansas, 1954

Major Professor: Paul L. Day

Day-old chicks rendered folic acid-deficient by means of a purified diet had significantly ($P < 0.01$) lower levels of coenzyme A (CoA) in their livers than did the control chicks. The heart CoA levels were slightly reduced in the deficient chicks when compared to the controls. Rats rendered folic acid-deficient by means of a purified diet containing succinyl-sulfathiazole also exhibited significantly ($P < 0.01$) lower levels of CoA in their livers than did the folic acid-fed controls. Heart CoA levels in the rats were not reduced by the folic acid deficiency. The injection of preformed purines and nucleotides (adenine,

3-adenylic acid and 5-adenylic acid) had no effect on the liver CoA levels of folic acid-deficient rats.

The administration of aminopterin to normal rats for varying periods of time did not result in a reduction of liver CoA. An increase in the liver CoA levels resulted in the animals which received aminopterin until the toxic manifestations of the drug appeared. Part of this CoA increase is believed to be due to the loss in weight of the liver resulting from the severe inanition induced by aminopterin. Rats which were fasted for 36 to 48 hours showed an increase in the liver CoA levels when compared to non-fasted controls.

The inclusion of sodium benzoate in a purified diet fed to rats did not reduce the liver CoA levels when compared to controls receiving the same diet plus folic acid. The *in vivo* acetylation of sulfanilamide was not altered by feeding sodium benzoate.

The addition of folic acid to a pantothenic acid-deficient diet fed to rats did not alter the growth rate of the animals. Also, the rapid increase in weight caused by an injection of pantothenic acid into pantothenic acid-deficient rats was not further increased by the simultaneous injection of folic acid.

The injection of pantothenic acid into pantothenic acid-deficient rats caused a rapid synthesis of CoA. The simultaneous injection of aminopterin and pantothenic acid into pantothenic acid-deficient rats did not block the synthesis of CoA. The administration of aminopterin to pantothenic acid-deficient rats until the toxic manifestations of the drug appeared resulted in a blockage of CoA synthesis when pantothenic acid was subsequently injected. This blockage of CoA synthesis by aminopterin was overcome by the injection of leucovorin.

The destruction of CoA by liver homogenates was studied. These studies indicated that in both the chick and rat liver homogenates a folic acid deficiency does not alter the rate of CoA destruction.

These data indicate a metabolic relationship between folic acid and coenzyme A. Folic acid apparently is involved in the synthesis of CoA. It is believed that folic acid functions in the synthesis of the adenine or adenosine moiety of the CoA molecule.

122 pages. \$1.53. MicA54-1668

EFFECT OF HEAT DURING PROCESSING OF NONFAT DRY MILK SOLIDS USED FOR COTTAGE CHEESE MANUFACTURE

(Publication No. 8485)

Arthur William Rudnick, Jr., Ph.D.
University of Minnesota, 1954

Adviser: S. T. Coulter

An investigation was made to determine why heating of skimmilk in excess of pasteurization before and during drying alters the body qualities of cottage cheese made from that milk.

Skimmilk, reconstituted condensed skimmilk and reconstituted nonfat dry milk solids were made into

curds by a controlled laboratory procedure or into cottage cheese on a small factory scale using a standard procedure. Moisture content of these curds were determined at intervals after cutting and the amount of moisture expelled calculated. By comparing the moisture expulsion of experimental lots with that of control lots of the same milk, the following conclusions were made:

1 - Moisture expulsion of acid curds made from lots of the same skimmilk can be varied by changes in curd cube size and changes in the acidity at which the curds are cut. Small cubes will expel more moisture than large cubes. Curds cut when acidity is relatively low will expel more moisture than those cut when acidity is higher.

2 - There is an inverse relationship between percentage of serum proteins denatured by heat treatment of the skimmilk and the moisture expelled by curds made from these milks.

3 - Curd moisture expulsion can be reduced by adding heat denatured serum proteins to raw skimmilk.

4 - When curds were made from heated skimmilk and heated skimmilk with added undenatured serum proteins, there was little difference in moisture expulsion.

5 - Cottage cheese body qualities are similar when made from lots of heated skimmilk with and without added calcium chloride.

6 - Moisture expulsion of curds made from reconstituted 40 percent condensed skimmilk is the same as that of curds from skimmilk heated to the same extent; but superheating the condensed skimmilk will result in a more fragile curd.

7 - Curds made from reconstituted nonfat dry milk solids are more fragile than those made from skimmilk heated to the same degree. There is an increase in curd fragility as the solubility index of the powder is increased.

8 - Browning nonfat dry milk solids by heating the powder in a hot air oven has no effect on the body qualities of cottage cheese made from the reconstituted powder. The browning has little effect on solubility index of the powder.

9 - When small amounts of bacterial starter culture are used in making curds from reconstituted condensed skimmilk and nonfat dry milk solids, the time required for acidity to be increased to pH 4.7 appears to be directly related to the preheat treatment given the skimmilk. The time needed seems to reach a minimum when the skimmilk has been heated to 165° F. for 17 minutes and increases when heat treatment is either higher or lower.

115 pages. \$1.44. MicA54-1669

A STUDY OF THE MECHANISM OF SULFHYDRYL ACTION IN MILK

(Publication No. 8495)

Alan Thomas, Ph.D.
University of Minnesota, 1954

Adviser: S. T. Coulter

Because of the frequency of oxidative deterioration in the dairy products, means of preventing or retarding it have become important to manufacturers and consumers alike. The serum protein sulfhydryl (-SH) groups of milk and milk constituents were investigated to determine their possible antioxygenic action in fluid milk. Analytical determinations included oxygen uptake, o-iodozobenzoate reducing value, thiamine disulfide reducing value, fat peroxide value, nitroprusside reaction, and organoleptic analysis.

The oxygen uptakes of various milk systems at 73.9° C. (165° F.) for periods up to five hours were determined by means of a Warburg respirometer. The systems studied were milk, cream, skimmilk, buttermilk, butterfat, sodium caseinate, lactose, serum protein, and beta lactoglobulin.

It was found that the plasma constituents took up the major portion of the oxygen absorbed by milk. Analysis showed that approximately twice as much oxygen was taken up by skimmilk (3-4 microequivalents of oxygen per 3 ml. milk) as would be required to oxidize its -SH to -SS-, indicating that oxidation to higher states probably occurred. Added copper was found to increase the rate and amount of oxygen taken up by milk. This increase could be prevented by the addition of sufficient quantities of the sequestering agent di-hydrogen, di-sodium Versenate (20 ppm Versenate to 1 ppm added copper). The oxygen uptake of skimmilk was greatly inhibited when the -SH groups were blocked with p-chloromercuribenzoate.

Butterfat took up negligible amounts of oxygen and sodium caseinate did not exhibit any oxygen uptake. Lactose in phosphate buffer at pH 6.6 took up considerable quantities of oxygen (10-12 microequivalents of oxygen per 3 ml. of a 5 per cent solution) in the presence of metallic ions. This uptake, believed to be due to a lactose-phosphate interaction, was suppressed by the addition of 5 ppm of the Versenate, or 2.75 per cent sodium caseinate, or by ion exchange of the lactose with a resin capable of replacing copper. Lactose is not considered to be responsible for a significant uptake of oxygen in milk. Milk serum proteins and beta lactoglobulin take up oxygen, the rate apparently depending upon the copper content of the preparation.

A study of heated milk systems in which heat-liberated -SH groups were maximum in one case and minimum in the other (either oxidized or blocked with p-chloromercuribenzoate) revealed that oxidation occurred more rapidly when the -SH groups were not available. The oxidized flavor developed more rapidly, the fat peroxide values increased at a more rapid rate, and the nitroprusside reaction disappeared more swiftly when there were little or no

-SH groups free. This was taken as an indication that the -SH groups of serum proteins in fluid milk protect the lipide constituents from oxidation.

119 pages. \$1.49. MicA54-1670

CHEMISTRY, ORGANIC

THE REARRANGEMENTS OF ALLYL ETHERS OF SOME HYDROXYMETHYLENE COMPOUNDS

(Publication No. 8445)

Nicolas Brodoway, Ph.D.
University of Minnesota, 1953

Major Advisor: Dr. W. M. Lauer

Ethyl β -allyloxycrotonate was prepared by the interaction of ethyl acetoacetate with allyl orthoformate in the presence of acid catalysts. The rearrangement of this ester to ethyl α -allylacetate was accomplished.

Transetherification of ethyl β -ethoxycrotonate with cinnamyl alcohol was shown to occur with concurrent rearrangement of the cinnamyl group. Migration of the cinnamyl group was shown to be accompanied by an α , γ -shift of the point of attachment of the cinnamyl group. Isomeric ethyl α -cinnamylacetate was prepared for comparative purposes.

The product of transetherification of ethyl β -ethoxycrotonate with γ , γ -dimethylallyl alcohol was shown to be identical with the product of interaction of ethyl β -chlorocrotonate and sodium γ , γ -dimethylallyloxide. Migration with inversion of the allyl group occurred rapidly at the temperature of formation of the enol ether, and ethyl β -(γ , γ -dimethylallyloxy)-crotonate could not be isolated. No evidence of abnormal inversion was found.

Four methods of preparation of allyl enol ether of 2-formylcyclohexanone were investigated. Alkylation with allyl bromide in a polar solvent led to approximately equal portions of O- and C- alkylation. The enol ether was shown to be stable to rearrangement under the conditions of the above alkylation. C-alkylation was followed by a reverse Claisen condensation to yield 2-allylcyclohexanone. The enol ether was prepared in seventy per cent yield by the use of allyl orthoformate. The use of p-toluenesulfonic acid as an alkylating agent gave low yields of the enol ether. Transetherification of 2-ethoxymethylcyclohexanone with allyl alcohol occurred in good yields but gave a mixture of the allyl enol ether and 2-allyl-2-formylcyclohexanone. Distillation of 2-allyloxymethylene-cyclohexanone at atmospheric pressure gave eighty to eighty-five per cent conversion to 2-allyl-2-formylcyclohexanone.

Transetherification of 2-ethoxymethylene-cyclohexanone with cinnamyl alcohol was shown to occur with rearrangement and inversion of the cinnamyl group. The product, 2-(α -phenylallyl)-2-formylcyclohexanone, was hydrolyzed to give

2-(α -phenylallyl)-cyclohexanone. Hydrogenation of the olefinic double bond gave 2-(α -phenylpropyl)-cyclohexanone. Alkylation of cyclohexanone with 1-bromo-1-phenylpropane gave an authentic sample of 2-(α -phenylpropyl)-cyclohexanone.

Transesterification of 2-ethoxymethylene-cyclohexanone with γ,γ -dimethylallyl alcohol was shown to occur with rearrangement and inversion to give 2-(α,α -dimethylallyl)-2-formylcyclohexanone. Hydrolysis of this dicarbonyl compound followed by hydrogenation of the olefinic double bond gave 2-tert-amylcyclohexanone in twenty per cent overall yield.

2-tert-Amylcyclohexanone was prepared by alkylation of p-chlorophenol with 2-methylbutene-2, followed by high pressure hydrogenation over Raney nickel. The alcohol was oxidized with chromic acid to give an authentic sample of 2-tert-amylcyclohexanone. The semicarbazones and 2,4-dinitrophenylhydrazone of the two samples were shown to be identical. 90 pages. \$1.13. MicA54-1671

CORRELATION OF STRUCTURE AND REACTIVITY IN TETRAZOLES

(Publication No. 8773)

Charles Robert Jacobson, Ph.D.
Lehigh University, 1954

A synthetic route has been developed for the preparation of tetrazolylacetic esters and acids from starting materials already containing the carboxylate group. The preparation of 1-substituted-5-tetrazolylacetates was initiated from N-substituted malonamates while 5-substituted-1-tetrazolylacetates were prepared from N-acyl- α -amino acid esters. In each case, tetrazole ring closure was effected by conversion of the amide grouping into the corresponding imide chloride with phosphorus pentachloride followed by addition of hydrazoic acid with accompanying cyclization. Attempted extension of this synthetic route to the preparation of tetrazolylcarboxylates was unsuccessful. The apparent difference in the ease of decarboxylation of the two series of tetrazolylacetic acids is discussed.

The synthesis of 1-phenyl-5-acetyltetrazole and the results of a wide variety of reactions to which it and its derivatives have been submitted are reported. Where possible, these results have been interpreted in terms of the effect of the tetrazole nucleus on the attached acetyl group.

It has been found that 1-phenyl-5-chloromethyltetrazole is highly reactive in S_N2 reactions but quite unreactive under S_N1 conditions. Although it did not give an isolatable nitrile upon reaction with alkali cyanide, 1-phenyl-5-cyanomethyltetrazole has been prepared by dehydration of 1-phenyl-5-tetrazolylacetamide.

Reaction of this chloromethyl derivative with sodio-acetoacetic and sodio-malonic esters has given the corresponding acetoacetate and malonate in fair yields.

In one of the several unsuccessful attempts to

prepare 1-phenyl-5-tetrazolylcarboxaldehyde, potassium 1-phenyl-5-tetrazolylcarboxylate has been isolated. The corresponding acid was found to be unstable in free state. The relative decarboxylation abilities of 1-substituted- and 2-substituted-5-tetrazolylcarboxylic acids are discussed.

The methiodide of 1-phenyl-5-methyltetrazole has been prepared and the observed effect of N-methylation on the reactivity of the 5-methyl group is discussed in terms of the probable position of methylation.

The results of several attempts to metalate, 1,5-disubstituted tetrazoles with Grignard reagents are interpreted on the basis of the apparent structure of the tetrazole ring.

The ultraviolet absorption spectra of a series of nitro- and amino-phenyltetrazoles have been measured and compared as an additional means of determining the ability of the tetrazole nucleus to influence substituent groups.

The infrared absorption spectra of several new tetrazole derivatives are presented.

134 pages. \$1.68. MicA54-1672

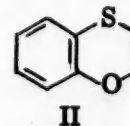
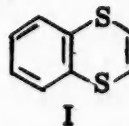
BENZO-1,4-OXATHIADIENE

(Publication No. 8459)

John Donald Jones, Ph.D.
University of Minnesota, 1953

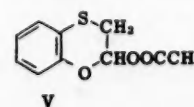
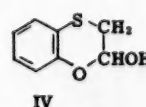
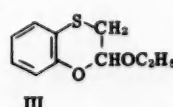
Major Advisor: William E. Parham

Parham, Roder, and Hasek¹ recently reported data which indicate that the heterocyclic ring of benzo-1,4-dithiadiene (I) does possess a considerable degree of aromatic character. On the basis of the known electronic effects of oxygen and sulfur, it was anticipated that the sulfur-containing ring of benzo-1,4-oxathiadiene (II) would possess a lower degree of aromatic character than that of I. This difference was expected to manifest itself in that: (a) the double bond of the heterocyclic ring would be more difficult to introduce into II than I; and (b) that once formed the double bond of II would be less stable than that of I. In order to



test the validity of these predictions, a study of the synthesis and reactions of II was made.

I. Benzo-1,4-oxathiadiene was synthesized by three methods:

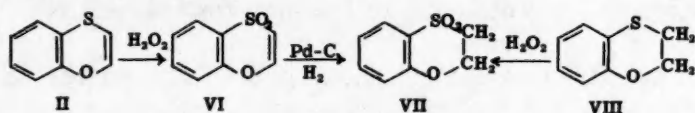


1. 2-Ethoxybenzo-1,4-oxathiene (III) was dealkoxylated in low yield by heating with phosphorus pentoxide. III was prepared by alkylation of monothio-catechol with diethyl bromoacetal, and treatment of the product of this reaction with acid.

2. 2-Hydroxybenzo-1,4-oxathiene (IV), prepared by hydrolysis of III, was dehydrated in low yield with phosphorus pentoxide and pyridine.

3. 2-Acetoxybenzo-1,4-oxathiene (V), prepared by acetylation of IV, was deacetylated in high yield by pyrolysis.

II. The structure of benzo-1,4-oxathiadiene was established by oxidation to the corresponding sulfone VI which was reduced to sulfone VII. VII was independently synthesized by oxidation of the sulfide VIII obtained from the reaction of monothiocatechol and ethylene bromide.



III. The reactions of benzo-1,4-oxathiadiene studied included:

1. Reaction with air. Observations were made which indicate II undergoes autoxidative polymerization.
2. Ethanolysis of II formed III.
3. Reaction with 2,4-dinitrophenylhydrazine (a) in air, cleaved II to form glyoxal 2,4-dinitrophenylosazone; and (b) under nitrogen, cleaved II to form the hydrazone of IV. Two mechanisms to account for these results were considered: (a) reaction of II with air to form an intermediate oxide with subsequent hydrolysis of the oxide; (b) cleavage of II to the 2,4-dinitrophenylhydrazone of IV with subsequent cleavage of the hydrazone to form the osazone. A study of the reactions of β -oxy and β -thiohydrazones with 2,4-dinitrophenylhydrazine (mechanism b) revealed that these compounds are cleaved to the osazone, but that mechanism a was more probable.
4. Bromination of II formed a relatively stable dibromide which was readily hydrolyzed to glyoxal.
5. Nitration of II gave an unstable nitration product which spontaneously lost oxides of nitrogen.
6. Formylation of II gave a solid aldehyde in 54% yield.

IV. Comparison of the properties of I and II.

1. Catalytic dealkoxylation of III with phosphorus pentoxide formed II in a maximum yield of 20% under conditions where 2-ethoxybenzo-1,4-dithiene was dealkoxyated in 72% yield. Vapor phase dealkoxylation of 2-ethoxybenzo-1,4-dithiene gave I in 58% yield, whereas none of II could be obtained from III under similar conditions. These data indicate that the double bond of the heterocyclic ring is more difficult to introduce into II than I.

2. The bromination addition product of I was prepared and its structure was confirmed. This dibromide rapidly lost hydrogen bromide whereas the dibromide of II was stable. These data indicate that there is a greater tendency to retain conjugation in I than II.

3. The double bond of the sulfur-containing ring of II reacts with ethanol and water under conditions where the analogous double bond of I is stable. These data indicate that the double bond of the heterocyclic ring of II is less stable than that of I. It was concluded that the chemistry of II is that of a rather stable vinyl ether. 159 pages. \$1.99. MicA54-1673

I. W. E. Parham, T. M. Roder, W. R. Hasek, J. Am. Chem. Soc., 75, 1647 (1953).

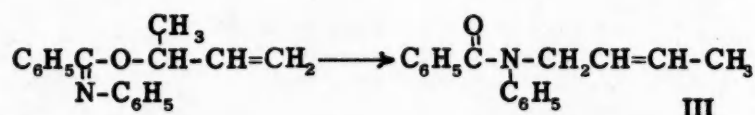
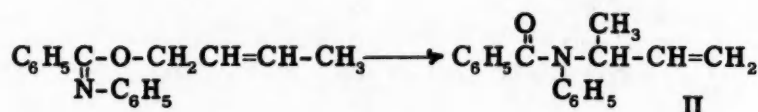
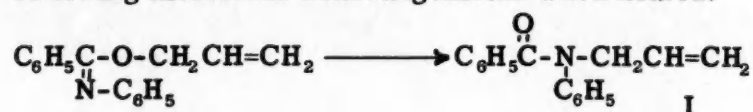
STUDIES IN THE REARRANGEMENT OF ALLYLIC IMIDO ETHERS

(Publication No. 8464)

Robert G. Lockwood, Ph.D.
University of Minnesota, 1953

Major Advisor: W. M. Lauer

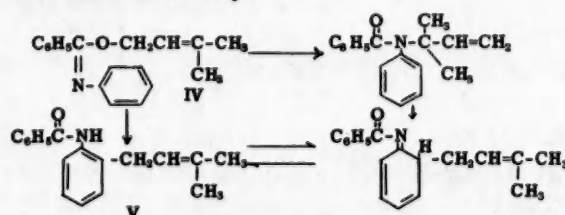
In 1937 Mumm and Möller¹ reported that the allyl, γ -methylallyl, and α -methylallyl ethers derived from N-phenylbenzimidoyl chloride underwent the following molecular rearrangements when heated:



Thus the behavior of these imido ethers is similar to that of the corresponding phenyl allyl ethers: a Claisen-type rearrangement occurred. The second and third examples indicate that rearrangement proceeded with inversion of the allylic side chain.

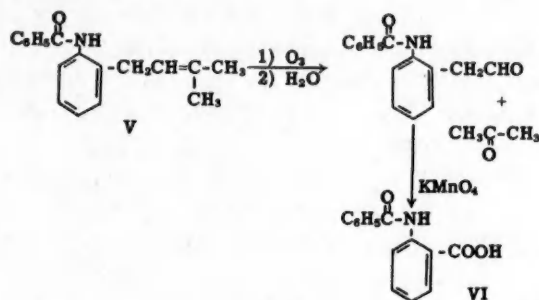
The structure of N-allylbenzanilide (I) was established by synthesis from benzoyl chloride and N-allylaniline, while II and III were first hydrogenated and then hydrolytically cleaved to yield benzoic acid and the known amines, respectively, N-sec-butyraniline and N-n-butyraniline.

The present investigation was undertaken in order to extend these studies to include the thermal rearrangement of N-phenylbenzimidoyl γ , γ -dimethylallyl ether (IV). There is evidence that a normal α - γ transposition does not occur in the Claisen rearrangement when both γ -hydrogen atoms of the allyl side chain are replaced by methyl groups.² In the present case the imido ether did not follow the behavior pattern set by the three earlier examples: the isomeric product (V) indicated that a rearrangement, without inversion, analogous to the para-Claisen rearrangement had occurred, instead. The following mechanism may account for this anomaly:



Ozonolysis of V gave acetone, which established the structure of the side chain. A viscous aldehyde

was also formed in the reaction. Oxidation of it gave the known compound N-benzoylanthranilic acid (VI), which proved that the allylic chain and the benzamido group of V were situated ortho to each other on the benzene ring.



Further evidence from the relative positions of the groups was obtained from the hydrolytic cleavage of V. The unsaturated amine which was isolated was converted to the corresponding bromo compound by a modified Sandmeyer reaction. Oxidation of the bromo compound yielded o-bromobenzoic acid.

Mumm and Möller's rearrangement of N-phenylbenzimidoyl allyl ether to N-allylbenzanilide (I) was repeated in the present investigation, as well. The structure of I was established by alkaline hydrolysis to benzoic acid and N-allylaniline, and by hydrogenation and hydrolysis to benzoic acid and N-n-propylaniline. 105 pages. \$1.31. MicA54-1674

1. O. Mumm and F. Möller, *Ber.*, **70**, 2214 (1937).
2. W. M. Lauer and O. Moe, *J. Am. Chem. Soc.*, **65**, 289 (1943).

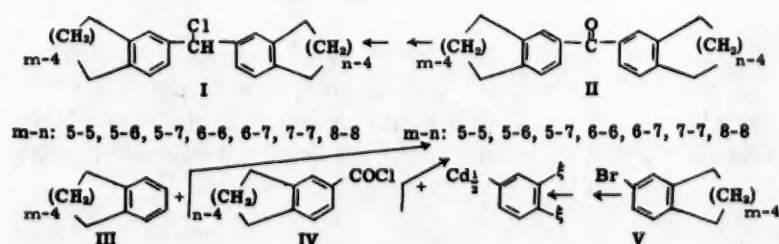
THE SYNTHESIS AND RATES OF HYDROLYSIS OF SOME DI-BENZCYCLOALKENYLCHLOROMETHANES

(Publication No. 8471)

William Robert Moore, Ph.D.
University of Minnesota, 1954

Co-advisers: Richard T. Arnold
Stuart W. Fenton

Arnold and Truett and later Baddeley and Gordon found that the rates of solvolysis of 3,4-tri-, tetra-, and pentamethylenebenzhydryl chlorides decreased as the alicyclic ring size increased. This result was the first experimental demonstration of the steric requirements of hyperconjugation. The present investigation was undertaken to substantiate the previous experimental observations and to gain a further insight into the nature of the steric requirements of hyperconjugation. To this end, the rates of hydrolysis in aqueous acetone of a series of di-benzcycloalkenylchloromethanes I were investigated.



The di-benzcycloalkenyl ketones II were prepared by reaction of the acid chlorides IV with the benzcycloalkenes III in the presence of aluminum chloride. The structures of the ketones II were proved, establishing the β -ar selectivity of the Friedel - Craft substitution, by comparison (infrared spectra and melting point data) with the ketones obtained from the reaction of the acid chlorides IV with the cadmium derivatives of the β -ar-bromobenzcycloalkenes V. Reduction of the ketones II employing aluminum isopropoxide yielded with corresponding carbinols which were converted to the benzhydryl chlorides I by treatment with hydrogen chloride in benzene.

The first order rates of hydrolysis of the benzhydryl chlorides I in "90%" aqueous acetone were determined at 0° and 25° by conductometrically following the concentration of hydrogen chloride produced.

Compound I-m-n	Relative Initial Rates, 25°
I-5-5	2.42
I-5-6	1.89
I-5-7	1.58
I-6-6	1.56
I-6-7	1.25
I-7-7	1.00*
I-8-8	1.19

*Specific Rate:

$$3.39 \times 10^{-3} \text{ sec}^{-1}$$

The products were shown to be the expected carbinols and the back reaction was demonstrated to be negligible. In agreement with the theory of Hughes and Ingold, chloride ion was found to exert an inhibiting mass law effect, which, by reversal of the "ionization" of a benzhydryl chloride I, results in a lowering of the rate of hydrolysis. The intensity of this effect increased with the reactivity of the benzhydryl chloride I. The rate sequence demonstrates that as the size of the alicyclic ring is increased to seven members, the rate of hydrolysis decreases. This result is in agreement with the prediction that the maximum hyperconjugative effect of the α -methylene group (of the alicyclic ring) is attained when the β -methylene group is in the plane of the benzene ring and that the hyperconjugative effect decreases as the β -methylene group is removed from the plane of the benzene ring. The reversal of the rate sequence with the eight-membered ring compound I-8-8 suggests that the restricted conformations of the eight-membered ring bring into play some effect(s) other than normal β -methylene hyperconjugation.

The ultraviolet absorption spectra of the ketones II were measured in "isooctane" and 95% ethanol. As the size of the alicyclic ring increases, a very slight bathochromic shift of the N V band occurs accompanied by a small but significant increase in the extinction coefficient at the maximum. This result indicates that the factors controlling light absorption by the ketones II differ from the factors controlling the hydrolysis of the benzhydryl chlorides I.

259 pages. \$3.24. MicA54-1675

THE PREPARATION AND PROPERTIES OF QUATERNARY HYDRAZONES

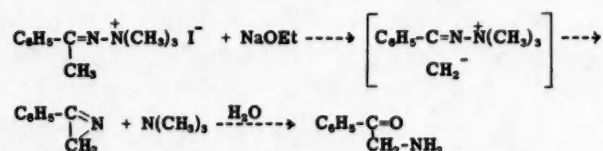
(Publication No. 8386)

Elmer Edwin Most, Jr., Ph.D.
University of Michigan, 1953

The reaction of ketones with N,N-dimethylhydrazine has been investigated under a variety of experimental conditions and found to proceed best with the anhydrous reagent in the absence of catalysts. By this means pinacolone, cyclohexanone, diisobutyl ketone, phenylacetone, dibenzyl ketone, 2,4-dinitrophenylacetone, acetophenone, benzophenone and dianisyl ketone have been converted to their dimethylhydrazones, all but two of which are new compounds. The infra-red and ultra-violet absorption spectra, the densities, refractive indices, and melting or boiling points of these substances have been measured and their significance discussed.

By reaction of the dimethylhydrazones with methyl iodide, compounds have been produced whose structure has been shown by degradation to be that of N, N,N-trimethylhydrazonium iodides. These represent a new class of compound, all of which were solids. Their ultra-violet spectra show that the quaternary hydrazone grouping is a chromophore bathochromic with respect to ketones, whereas the dimethylhydrazones show a small hypsochromic shift with respect to the parent ketones. The infra-red spectra of both the dimethylhydrazones and their quaternary salts show absorption assignable to the C=N group at 6.1μ .

The quaternary hydrazones were found to be stable toward direct Beckmann rearrangement. However, those having a methylene group adjacent to the hydrazone group underwent the Neber modification of the Beckmann rearrangement when heated with strictly anhydrous sodium ethoxide in ethanol. By this means several of the quaternary hydrazones were converted first to α -aminoketones and then to pyrazines. This represents the first attainment of a Beckmann type of rearrangement with an unmodified hydrazone. Typical behavior is shown with the example of the acetophenone derivative.



105 pages. \$1.31. MicA54-1676

THE RELATIVE STABILITIES OF CIS - TRANS ISOMERS OF FUSED RING SYSTEMS CONTAINING ANGULAR METHYL GROUPS

(Publication No. 8402)

Alexander Ross, Ph.D.
University of Michigan, 1953

In order to study the effect of an angular methyl substituent on the stereochemical stability of

ring-fusion epimers, a group of four stereochemical pairs of homophthalimides was synthesized. Incidental to this, some twenty-five new cycloaliphatic compounds were synthesized and characterized.

Equilibrium between the *cis* and *trans* isomers was attained by heating the substrates at 185-300° with a palladium-on-charcoal catalyst in a stainless steel micro-autoclave, and was in each case approached from either side. The equilibrated epimers could not be satisfactorily separated by chromatographic means, but by means of characteristic differences in infra-red absorption spectra, the composition of the mixtures could be determined with moderate accuracy. The results obtained are summarized herewith.

Compound	Equilibrium Composition	
	<i>cis</i> , %	<i>trans</i> , %
	32	68
	71	29
	60	40
	60	40

In addition, 9-methyldecalone-1 appeared to show preferred *cis* stability from a one-sided approach to the equilibrium composition.

These results indicate that the assumption currently held that *trans*-ring-fusion of six-membered rings is always more stable than *cis*-ring-fusion is not justified in such great generality, and that, in particular, angular methyl groups may reverse the relative stability. The methods of conformational analysis have been applied to correlate these observations with non-bonded interatomic interactions.

165 pages. \$2.06. MicA54-1677

A STUDY OF 1,3-SHIFTS

(Publication No. 8362)

Bertram Irwin Rowland, Ph.D.
University of Washington, 1954

As a part of a general study of thermal rearrangements in the category of 1,3-shifts, a study of the rearrangement of α -alkoxystyrenes to their respective isomeric ketones and of the Chapman rearrangement was undertaken.

A stereochemical study of the α -alkoxystyrene rearrangement was accomplished by preparing optically active α -*sec*-butoxystyrene and α -phenethoxystyrene and converting them to their respective ketones, which were extensively if not completely racemized. Both optically active β -methylvalerophenone and α -*sec*-butoxystyrene were shown to maintain the major portion of their optical activity during the rearrangement. Since a concerted or cyclic path seemed unlikely, the possibility of a homolysis or heterolysis was considered. α -Neopentoxystyrene was prepared and rearranged, and the product was shown to be identical with a synthetic sample of γ , γ -dimethylvalerophenone, both by infra-red spectra and the absence of a depression in the melting point of a mixture of the 2,4-dinitrophenylhydrazones of the ketones, indicating that the neo-pentyl group migrated without change in its skeletal structure. The rearrangement of α -*sec*-butoxystyrene, in the presence of a free radical source, was shown to proceed at a much lower temperature than required for the uncatalysed rearrangement. However no evidence of inhibition could be obtained for the reaction using chloranil as an inhibitor. The results would seem to indicate a complex situation, which probably involved a free radical path.

The study of the Chapman rearrangement consisted of preparing a number of substituted phenylbenzanilimino ethers by displacement on benzanilimino chloride by the respective phenoxide and determining the rate of rearrangement of the imino ether to the N,N-diarylbenzamide. The analytical procedure consisted of a potentiometric titration with perchloric acid in glacial acetic acid as titrant, and followed potentiometrically with a glass electrode and silver-silver chloride electrode. Diphenyl ether was used as the reaction solvent and the temperature at which most of the work was done was 255°. The order of the effect of substituents in order of decreasing rate was p-Aceto, o-Cl, p-Br, o-Me, o-OMe, H, m-Me, o-i-Pr, p-i-Pr, p-t-Butyl, p-Et, p-Me, o-t-Butyl, p-OMe. The enthalpy and entropy of activation was determined for the unsubstituted, p-Cl and o-Me phenylbenzanilimino ethers. A four membered cyclic intermediate was postulated as the reaction path, based on the first order kinetics, the values for the entropy, the indication of a direct nucleophilic displacement of the migrating phenyl, and information obtained from previous investigations.

Substituent	ΔH^\ddagger kcal. (528°K)	ΔS^\ddagger e.u.
unsub.	36.86 \pm 0.12	- 8.35
p-Cl	35.22 \pm 0.07	-10.62
o-Me	40.06 \pm 0.06	- 2.39

In order to explain the acceleration by an ortho substituent, steric inhibition of rotation was postulated; the ortho group prevented free rotation in the ground state of a bond whose rotation was to be frozen out in the transition state, causing a decrease in the entropy loss. This would give a net acceleration in rate in going from the *para* to the *ortho* substituted

isomer. However, it was found that as the bulk of the alkyl substituent increased, the ratio of the rate constants of the *ortho* to *para* substituent decreased, with p-t-butyl- reacting faster than o-t-butylphenylbenzanilimino ether. This difficulty might be resolved by dividing the entropy term into two steric terms; steric inhibition of rotation and steric compressibility. Increased bulk might increase the steric compressibility in going from the ground state to the transition state, causing a greater decrease in entropy. This would offset the entropy advantage obtained by the steric inhibition of rotation.

A plot of the log of the rate of the rearrangement of p-substituted phenylbenzanilimino ethers against the log of the rate of piperidine displacement on p-substituted-o-nitrobromobenzene afforded good linear agreement, possibly indicating similar electronic demand in the two reactions.

Which of the two geometric isomers of the phenylbenzanilimino ether was studied, was considered, but although there seemed to be sufficient basis for preference of one of the isomers, no definite conclusion could be made. 129 pages. \$1.61. MicA54-1678

A STUDY OF SOME MIXED AZO NITRILES

(Publication No. 8414)

Chester Earl Smith, Jr., Ph.D.
University of Michigan, 1954

A study of mixed azo nitriles, which have an aromatic group attached directly to the azo linkage on one side and an α -aliphatic nitrile group on the other, has been undertaken with the purpose of providing azo compounds that would produce free radicals at higher temperatures than formerly known azo nitriles do.

Previous studies of aliphatic azo compounds, particularly aliphatic azo nitriles, have shown that the thermal decomposition of these compounds follows first order kinetics. It has been demonstrated that the decomposition involves a free radical mechanism and that these radicals are useful as polymerization initiators.

Seven new mixed azo nitriles and five new and one known mixed hydrazo nitriles have been prepared. Most of the azo compounds were obtained by oxidation of the corresponding hydrazo compounds. Most of the hydrazo compounds were produced by reaction between phenylhydrazine and an aliphatic ketone cyanohydrin.

The mixed azo nitriles were found to decompose thermally at temperatures above 140°. The products of the decomposition of α -phenylazoisobutyronitrile at 165° were shown to include nitrogen, diphenyl, tetramethylsuccinonitrile, α -phenylisobutyronitrile, and hydrogen cyanide. These products substantiate the free radical mechanism proposed for the decomposition.

The kinetics of the thermal decomposition of six of the mixed azo nitriles were studied at 165° by measurement of the nitrogen evolved at definite time intervals. The rate for one compound was also measured

at 175°. First order kinetics were observed. In general, less than stoichiometric amounts of nitrogen were obtained. The most reasonable explanation for the nitrogen retention seems to be the occurrence of a simultaneous first order rearrangement to an hydrazone by migration of a group from the α -carbon atom to the nitrogen adjacent to the aromatic nucleus. In this event, the rate constant which was determined would be the sum of the rate constants for the cleavage reaction and the isomerization. Relatively small differences in the rate of decomposition were observed among the azo compounds.

Infra-red absorption spectra were determined for the mixed azo and hydrazo nitriles with the hope of obtaining evidence concerning the wave length of the N=N stretching vibration. This could not be definitely established. In addition to characteristic bands for the N-H and C=N groups, it was observed that the band for the cyano group was much weaker in the case of the azo compounds and a possible explanation is suggested for this phenomenon.

Ultraviolet absorption spectra for a mixed azo nitrile show an absorption band at 3820-3850 Å, comparable to the band for the aliphatic azo nitriles at 3450-3500 Å, but the band is stronger and has been shifted toward longer wave lengths by conjugation of the azo linkage with the aromatic group.

78 pages. \$1.00. MicA54-1679

THE SYNTHESIS AND SOME PROPERTIES OF CERTAIN AROMATIC KETONES: PART I. THE HIGH DILUTION FRIEDEL-CRAFTS INTRA-MOLECULAR ACYLATION REACTION. PART II. SPECTRAL STUDIES OF CERTAIN BENZENE RING AND SUBSTITUENT INTERACTIONS.

(Publication No. 8368)

William Alan Sweeney, Ph.D.
University of Washington, 1954

The high-dilution Friedel-Crafts reaction has been used to repeat the synthesis of 1,2-benzocycloocten-1-one-3. The ultraviolet absorption spectrum of this compound indicates a partial steric inhibition of resonance between the carbonyl group and the ring. Its carbonyl vibrational frequency shows the same displacement due to a ring-size effect as does that of cyclooctanone. It is concluded that the ring-size effect does not arise from an internal pseudo hydrogen bonding.

The ultraviolet absorption spectrum of the oxime of 1,2-benzocycloocten-1-one-3 indicates that resonance between the oxime group and the benzene ring is completely sterically inhibited. Treatment of this oxime with sulfuric acid brought about only a Beckmann rearrangement.

The high-dilution Friedel-Crafts reaction was also used to produce 10,12-dimethyl-1,2-benzocycloocten-1-one-3. Both the chemical and light absorption properties of this compound showed that it was a sterically inhibited ketone similar to acetomesitylene.

It underwent deacylation in sulfuric acid to yield ω -(3,5-dimethylphenyl)-hexanoic acid. A spectrophotometric study of this reaction indicated the formation of an unidentified transient intermediate.

The pKa and specific rate constants for the deacylation of 2,6-dimethylacetophenone were determined in sulfuric acid at 38.9°.

When the high-dilution Friedel-Crafts reaction was applied to ω -phenylheptanoyl chloride, dimeric and trimeric ring closure were obtained in low yield and no monomeric ketone was found. When applied to ω -phenyloctanoyl chloride, a qualitatively similar product was obtained. However, when this reaction was applied to ω -phenyldecanoyl chloride, a monomeric ring closure product as well as the dimeric product was obtained in low yield. The benzene ring of the monomeric product was shown to be coupled in the para positions. The possibility of interaction between two benzene rings in the dimeric products is discussed.

The influence of steric factors on ultraviolet absorption is discussed with particular attention being focussed on non-coplanarity and strain. A method of explaining the influence of strain on the wave length of maximum absorption is proposed.

A study was made of the shifts in ultraviolet absorption spectra produced by alkyl groups in a number of benzene derivatives possessing electron-withdrawing substituents. It was found that the shift was approximately the same for different alkyl groups with the shift increasing slightly with increased branching of the alkyl group. The shift was found to be insensitive to the configuration of the alkyl group. It is concluded that these facts can be better explained in terms of dispersion interactions than hyperconjugation.

An alternate explanation is advanced for the kinetic investigations which have been used as evidence of hyperconjugation.

200 pages. \$2.50. MicA54-1680

A STUDY OF THE CONDENSATIONS OF ALPHA, BETA-UNSATURATED KETONES WITH ALDEHYDES

(Publication No. 8369)

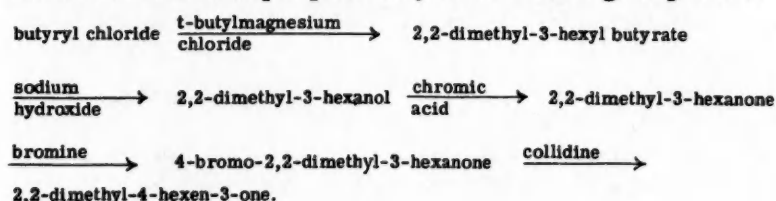
William Jack Wasserman, Ph.D.
University of Washington, 1954

The condensation of butyraldehyde with mesityl oxide catalyzed by potassium hydroxide gave 2-methyl-2,5-nonadien-4-one. Hydrogenation of this condensation product resulted in the formation of 2-methyl-4-nonanone which was shown to be identical with the authentic ketone prepared by the dichromate oxidation of 2-methyl-4-nonanol, obtained from the reaction of isobutylmagnesium bromide with n-hexanal. Synthesis of 4-methyl-2-nonanone, which possessed the other possible structure for the hydrogenated product of the butyraldehyde - mesityl oxide condensation, was accomplished by the reaction of 2-bromoheptane with sodioacetoacetic ester followed by hydrolysis and decarboxylation. The 2-bromoheptane was prepared

by the treatment of 2-heptanol with phosphorus tribromide.

Products resulting from the self-condensation of butyraldehyde were also obtained from the above condensation. 2-Ethyl-2-hexenal was found in addition to a third product which was probably 2,4-diethyl-2,4-octadienal. In an attempt to obtain a larger sample of the latter for further examination the residue remaining after the distillation of stock butyraldehyde was distilled, giving 2-ethyl-2-hexenal, butyric acid, butyraldol and 2-ethyl-3-hydroxy-1-hexyl butyrate. The ester was identified by an examination of the saponification products.

Attempts to prepare, 2,2-dimethyl-4-hexen-3-one by the condensation of acetaldehyde with pinacolone and by the reaction of t-butylmagnesium chloride with lithium crotonate failed. The former attempts gave 2,2,5,6,6-pentamethyl-4-hepten-3-one (resulting from the self-condensation of pinacolone) and acetaldehyde self-condensation products, while the latter gave 3,4,4-trimethylpentanoic acid. 2,2-Dimethyl-4-hexen-3-one was prepared by the following sequence:



The reaction of crotonaldehyde with t-butylmagnesium chloride followed by the oxidation of the resulting 2,2-dimethyl-4-hexen-3-ol with the chromic acid - pyridine complex also gave 2,2-dimethyl-4-hexen-3-one.

The condensation of benzaldehyde with 2,2-dimethyl-4-hexen-3-one catalyzed by sodium ethoxide gave 2,2-dimethyl-7-phenyl-4,6-heptadien-3-one which was identified by comparison with the authentic material prepared by the condensation of cinnamaldehyde with pinacolone.

An attempt to condense 2,2-dimethyl-4-hexen-3-one with pivalaldehyde in ethanol using sodium ethoxide catalyst gave 2,2-dimethyl-5-ethoxy-3-hexanone. Other attempts to condense 2,2-dimethyl-4-hexen-3-one with either pivalaldehyde or butyraldehyde failed.

Pinacolone was condensed with 3-(3,4-methylenedioxyphenyl)-2-propenal to give 4,4-dimethyl-1-(3,4-methylenedioxyphenyl)-1-penten-3-one which was also obtained from the condensation of pinacolone with piperonal.

In the case of mesityl oxide, condensation occurred in the alpha methyl position as opposed to the vinylogous gamma position. With 2,2-dimethyl-4-hexen-3-one, however, in which there is no open alpha position the condensation was forced into the vinylogous position with benzaldehyde, but no condensation at all was observed when aliphatic aldehydes were employed. 95 pages. \$1.19. MicA54-1681

CHEMISTRY, PHARMACEUTICAL

THE SYNTHESIS OF 2-HYDROXYOCTAHYDROQUINOLIZINE AND SOME OF ITS ESTERS

(Publication No. 8483)

Harold Jesse Rhodes, Ph.D.
University of Minnesota, 1953

1. A convenient synthesis of 2-ketoöctahydroquinolizine was developed as an intermediate step in the synthesis of the heretofore undescribed 2-hydroxyöctahydroquinolizine. Clemo's synthesis of 2-ketoöctahydroquinolizine involved, not only a greater number of reactions, but in addition, it was hampered by mechanical difficulties and low yields in practically every reaction. The following steps briefly summarize the modifications introduced:

a. The intermediate, ethyl pyridyl-2-acetate, was prepared by the method of Woodward and Kornfeld. Clemo prepared the corresponding methyl ester instead, and, in addition, employed the more difficult method of Oparina. The method of Woodward and Kornfeld was modified because of mechanical difficulties which contributed to inconsistent yields. The modifications introduced resulted in a more convenient synthesis as well as an increase in yield.

b. The yield of ethyl piperidyl-2-acetate, prepared by hydrogenation of ethyl pyridyl-2-acetate in the presence of glacial acetic acid and platinum oxide catalyst, was increased substantially by modification of the isolation process.

c. The preparation of ethyl piperidyl-2-acetate-1-β-propionate was simplified by reacting ethyl acrylate, instead of ethyl β-chloropropionate, with ethyl piperidyl-2-acetate. Again, an increase in yield accompanied this modification.

d. Clemo used potassium to effect the inner acetoacetic ester condensation of methyl piperidyl-2-acetate-1-β-propionate, and obtained 2-ketoöctahydroquinolizine after decarboxylation of the carbomethoxy intermediate. The yield of 2-ketoöctahydroquinolizine was approximately doubled by using sodium ethoxide as the condensing agent in an atmosphere of nitrogen.

2. 2-Hydroxyöctahydroquinolizine was obtained by hydrogenation of 2-ketoöctahydroquinolizine hydrochloride in an aqueous medium, or 2-ketoöctahydroquinolizine in a glacial acetic acid medium, using platinum oxide and ferrous sulfate as the catalysts.

3. 2-Chloroöctahydroquinolizine was prepared by the action of thionyl chloride on 2-hydroxyöctahydroquinolizine hydrochloride. 2-Chloroöctahydroquinolizine was used in two unsuccessful attempts to esterify xanthene-9-carboxylic acid, employing the free acid and the silver salt of the acid, respectively.

4. Twelve esters, each in the form of the hydrochloride and methobromide salts, were prepared from 2-hydroxyöctahydroquinolizine and the following substituted acetic acids: (1) diethylacetic, (2) phenylethylacetic, (3) phenylacetic, (4) cyclohexylacetic, (5) benzylacetic, (6) hexahydrobenzylacetic.

(7) diphenylacetic, (8) dicyclohexylacetic, (9) dibenzylacetic, (10) dihexahydrobenzylacetic, (11) fluorene-9-carboxylic*, and (12) xanthene-9-carboxylic acids.
88 pages. \$1.10. MicA54-1682

*The hydrochloride of the ester of fluorene-9-carboxylic acid could not be prepared in a crystalline form.

CHEMISTRY, PHYSICAL

MEASUREMENT OF THE ANGULAR VARIATION OF LIGHT SCATTERED FROM SINGLE DROPLETS

(Publication No. 8785)

James John Egan, Ph.D.
Indiana University, 1954

An instrument was constructed to measure the intensity of light scattered at various angles from a single droplet of about one micron radius or larger, illuminated by radiation of 4358 AU wavelength.

The general principle of the apparatus is to suspend a charged particle between two electrostatic plates, illuminate it with a parallel beam of monochromatic light, and measure the light scattered at various angles from the incident beam with a sensitive photometer. The two major problems encountered in the design and construction of such an instrument were the reduction of background light to the very low level comparable with scattering from a single aerosol particle, and the elimination of convection or air currents so as to allow centering of the particle in the incident beam.

The illuminating system produces an intense beam of parallel light of small cross sectional area. It has been designed to allow convenient interchanges of different optical filters, and can be used with a variety of light sources. The scattering cell consists of two electrostatic plates surrounded by an anti-convection jacket with appropriate windows. The cell and photomultiplier tube are enclosed in a brass chamber, surrounded by an oil bath which keeps the entire system at a uniform temperature and thus reduces convection currents inside the brass chamber. The photometer consists of a 1P21 photomultiplier in conjunction with a Leeds and Northrup microampere amplifier and an automatic recorder. In order to limit the field of view of the photometer, a lens system collects light scattered into a small solid angle and focuses it on the photocathode surface of the photomultiplier.

The particle size of the droplets was obtained by measuring the rate of fall and calculating the radius from Stokes law for spherical bodies falling in a viscous medium.

Measurements were made on several dioctyl phthalate particles varying in size from .7 to 1.7 microns radius. The scattered intensity was observed over an angle range of 40° to 140° measured from the direction of the incident plane wave. Both polarized and unpolarized incident light was used.

Plots of the relative intensity versus the scattering angle were given which show a typical diffraction pattern with the number of maxima increasing with the size of the particle.

The observed values were compared with those calculated from electromagnetic theory according to equations first derived by Gustav Mie. It is concluded that the instrument is a reliable means of studying light scattering and that possibilities exist for its use in the investigation of the intensity and polarization of light diffracted from non-spherical particles.

50 pages. \$1.00. MicA54-1683

SOME PRIMARY SALT EFFECTS WITH SOME PARAFFIN-CHAIN SALT SOLUTIONS

(Publication No. 8346)

Jay Arthur Erikson, Ph.D.
University of Washington, 1954

The rate constant of the bromoacetate-thiosulfate ionic reaction,



was measured in the presence of various concentrations of simple electrolytes and paraffin-chain salts. The simple electrolytes were the reactants and nitrate salt. The paraffin-chain salts were: sodium decanesulfonate at 25° C, sodium dodecanesulfonate at 40° C, tetramethylammonium dodecanesulfonate at 25° C, and tetramethylammonium tetradecanesulfonate at 25° and 40° C.

An earlier experiment indicated that the rate constant at 40° C was increased 25 percent as reactants of equal concentration were replaced by an ionic strength equivalent amount of sodium dodecanesulfonate. However, the results for the solutions containing the highest concentrations of the dodecanesulfonate were in error and were too high by as much as 16.2 percent. This error was due to the omission from the calculations of the error caused by the slight inequality of the reactant concentrations and by using a more refined method of calculation the increase was only 8 percent.

Using an improved technique and the more refined method of calculation the increase was again indicated, but to a lesser degree; 3 percent. This latter small increase was verified in two additional experiments. The primary improvement in the experimental technique was the adoption of the dead-stop method to detect the end point of the titration of the thiosulfate with iodine solution. With this method an iodine concentration of 10⁻⁷ N could be detected in the presence of the paraffin-chain salt.

The addition of tetramethylammonium tetradecanesulfonate to a constant amount of reactants resulted in an increase in the rate constant which was the same, within experimental error, as if an ionic strength equivalent amount of equal concentration reactants had been added instead. Therefore, these data are in agreement with the above mentioned slight increase in the rate constant, produced by replacing reactants with paraffin-chain salt.

If nitrate salt were replaced by the equivalent amount of paraffin-chain salt, the rate constant decreased; the decrease was somewhat more than the increase noted above. This was observed with tetramethylammonium dodecanesulfonate at 25° C and with tetramethylammonium tetradecanesulfonate at both 25° and 40° C. These data are not in disagreement with the data in which an increase was observed since the primary salt effect produced by nitrate salt is greater than the effect produced by an ionic strength equivalent amount of reactants. An explanation based on the supposition that the ion pairs $\text{NaOCOCH}_2\text{Br}$ and NaS_2O_3^- were present in the solution, is given to account for the change in the rate constant when reactants were substituted for an ionic strength equivalent amount of nitrate salt.

In solutions of paraffin-chain salts which did not contain micelles, especially with sodium decanesulfonate, no change in the rate constant was observed as paraffin-chain ion was substituted for nitrate ion. This indicates that in spite of the very different nature of the paraffin-chain ion compared with the nitrate ion, these singly charged ions influence the thiosulfate-bromoacetate reaction in the same manner.

The indifferent behavior of the rate constant to the presence of micelles, in solutions containing micelles, is crudely explained by extrapolating the theoretical behavior of the rate constant in solutions containing simpler complexes to a predicted behavior in the presence of micelles. Nothing conclusive is proved, but nevertheless no inconsistencies are found.

The rate constant for the reaction is related to the activity coefficients γ_T , γ_B and γ^* of the thiosulfate, bromoacetate and activated complex ions, respectively, by

$$k_{\text{exp}} = k_0 \frac{\gamma_T \gamma_B}{\gamma^*} \quad (2)$$

The slight variation in k_{exp} , the experimental rate constant, as simple electrolytes are replaced by paraffin-chain salts may indicate that the values of the activity coefficients of simple ions of the same sign as the micelle, are not altered significantly.

REFERENCE

Erikson, J. A. and Lingafelter, E. C. "Ionic Effects in a Paraffin-Chain Salt Solution as Measured by the Primary Salt Effect," *J. Coll. Sci.*, 4:591-598 (1949).

145 pages. \$1.81. MicA54-1684

A NEW VOLUMETRIC-GRAVIMETRIC APPARATUS AND PHASE DIAGRAMS FOR BINARY VAPOR ADSORPTION

(Publication No. 8771)

Ernest Gamble, Ph.D.
Lehigh University, 1954

The features of this study of the binary vapor adsorption of methanol-carbon tetrachloride mixtures on rutile titanium dioxide at 25° C. are: 1. The design and construction of a unique apparatus for mixed vapor adsorption based on simultaneous gravimetric and volumetric measurements. 2. The chemical and physical changes of the rutile surface with pretreatment and the effect upon subsequent adsorptions. 3. Phase diagrams in three dimensions for the methanol-carbon tetrachloride-rutile system as a novel approach to the representation of mixed vapor adsorption. Previous investigators have determined curves from various cross sections of these diagrams which are difficult to interpret and far less useful.

A hitherto unreported method of studying the adsorption of binary gas mixtures is described as a combination of gravimetric and volumetric procedures. The design of this apparatus yields optimum experimental precision and sensitivity. By measuring the elongation of a sensitive spring, supporting the adsorbent, while simultaneously measuring the pressure changes in the constant volume apparatus, one can determine the amount of each component adsorbed from a binary mixture.

A study of pure methanol isotherms on rutile samples outgassed at 25° C. has pointed out marked changes in the surface characteristics of the rutile due to successive adsorption isotherms and subsequent outgassing. The use of experimental BET "c" values, monolayer adsorption values, areas per adsorbed molecule and heats of wetting have been employed to explain the saturation of areas for chemisorption. The resultant surface after repeated isotherms is reproducible and adsorption is then reversible and physical in nature.

In the study of the adsorption of binary vapor mixtures of methanol and carbon tetrachloride on rutile at 25° C., both enhancement and diminution of the adsorption of the individual components have been observed. These non-ideal mixtures fail to show agreement with Langmuir's or Hill's mixed vapor relationships based on the pure component isotherms.

A new method for representing binary vapor adsorption is suggested using three dimensional phase diagrams and the Phase Rule. The isothermal phase diagram can be used to represent fully the entire range of behavior for any binary vapor-adsorbent system. Such a phase diagram has been developed for the system: methanol-carbon tetrachloride on rutile at 25° C. This phase diagram exhibits azeotropes just as does the binary liquid-vapor system.

Kinetic studies of single, pure component adsorption indicate that an activation energy, similar in magnitude to that observed for chemisorption, is necessary to account for the rate of physical adsorption of carbon tetrachloride on rutile. Limited mixed

vapor adsorption rate studies exhibit anomalous behavior, in that carbon tetrachloride is more rapidly adsorbed initially than methanol to the extent that the carbon tetrachloride must then be displaced or desorbed by the methanol as equilibrium is approached. Selectivity arising from monolayer preferential adsorption, and diffusion are the most probable causes for this unusual rate behavior.

126 pages. \$1.58. MicA54-1685

THE CRYSTAL STRUCTURES OF OXALIC ACID DIHYDRATE AND ALPHA IODIC ACID AS DETERMINED BY NEUTRON DIFFRACTION

(Publication No. 8371)

Bowman Staples Garrett, Sr., Ph.D.
University of Arkansas, 1954

The crystal structures of oxalic acid dihydrate and alpha iodic acid were determined by neutron diffraction. Several modern techniques were utilized in analyzing the data, including Fourier series, structure factor inequalities, statistical intensity distributions, least squares, and Fourier peak shape analysis. The positions of all the atoms, including hydrogen, were determined.

The structure of oxalic acid dihydrate was found to be consistent in its general features with that deduced from x-ray diffraction data. The oxalic acid molecule, including the hydrogen atoms is planar. The carbon - carbon bond length is that of a single bond; the carbon - oxygen bonds are nearly equal and are of lengths intermediate between those of single and double bonds. The oxygen - hydrogen distance in the acid molecule was found to be 0.10 longer than in gaseous water. The oxygen - hydrogen distances, the oxygen bond angles and O - H stretching frequencies of the water molecule in the crystal are very nearly identical with those of gaseous water. Strong evidence for libration of the carboxyl groups about the carbon - carbon bond was found in the analysis of the thermal motion of the atoms. The acid molecule is bound to the water oxygen atom through the carboxyl hydroxyl group. This is a short and apparently strong hydrogen bond; it is nearly linear and is only 2.52 Å in length. The oxalic acid dihydrate complexes are bound together in a three dimensional network of weaker hydrogen bonds between water hydrogen atoms and carbonyl oxygen atoms of neighboring acid molecules. Two helical chains of hydrogen bonds parallel to each diagonal of the a - c plane appear to be the main elements stabilizing the crystal.

Alpha iodic acid can be described as being composed of two chains of pentagonal rings, tilted at a mutual angle of $64^{\circ}25'$, which are parallel to the crystallographic b axis. The binding between iodic acid molecules within a chain is through a relatively short O - H - O bond and a very short intermolecular iodine - oxygen approach. Binding between chains appears to result from close approaches to iodine by oxygen atoms which project above and below the chains. The earlier description of the IO_3 group in

the molecule as an irregular pyramid was confirmed. An attempt to correlate structural data with results of nuclear quadrupole spectroscopy led to consistent but not unambiguous assignment of hybridized bonding orbitals to iodine. 177 pages. \$2.21. MicA54-1686

INFRARED INTENSITIES AND BOND MOMENTS OF FORMALDEHYDE

(Publication No. 8349)

Isamu Clarence Hisatsune, Ph.D.
University of Washington, 1953

The infrared intensities of the formaldehyde molecule have been measured in the gas phase using the pressure broadening technique. Special high-pressure high-temperature absorption cells were constructed using calcium fluoride and potassium bromide windows. The following values of absolute intensities expressed in cps/cm. at N.T.P. were obtained.

3.5 μ	($\nu_1 + \nu_4 + 2\nu_3$)	17.1×10^{12}
5.7 μ	(ν_2)	7.8 ₁
6.7 μ	(ν_3)	1.2 ₄
8 μ	($\nu_5 + \nu_6$)	1.3 ₂

Normal coordinate analysis was carried out and a set of force constants was obtained which gave frequency fits of the CH_2O , the CD_2O , and the CHDO molecules with an average deviation of about 1%. These constants were: C-H and C-O stretching, 4.33×10^5 and 12.3×10^5 dyne/cm. respectively; H-C-O, H-C-H, and the out-of-plane bendings, 0.826×10^{-11} , 0.396×10^{-11} and 0.354×10^{-11} erg/rad.² respectively; C-O stretch and H-C-H angle bending interaction, -0.263×10^{-3} erg/cm.rad.

The Coriolis interaction between the out-of-plane bending mode and the in-plane asymmetric bending mode was also investigated and equations for the dipole moment matrix elements of the unperturbed and perturbed states were obtained. From these equations it was found that the signs of the dipole moment derivatives with respect to the normal coordinates for these two vibrations should be the opposite from each other. With this result and those of the normal coordinate analysis, bond moments and their derivatives were calculated for the various symmetry species.

Since most of the infrared absorption bands overlapped with each other, only ranges of possible values for these moments and derivatives were obtained. The values chosen to get consistency in the signs and magnitudes were: $\mu_{\text{CH}} = 0.5$ D. ($\text{C}^- - \text{H}^+$), $\partial\mu/\partial r_{\text{CH}} = 1.3 \times 10^{-10}$ e.s.u.; $\mu_{\text{CO}} = 1.9$ D. ($\text{C}^+ - \text{O}^-$), $\partial\mu/\partial r_{\text{CO}} = -1.9 \times 10^{-10}$ e.s.u. The B_1 symmetry block gave an abnormally large value of about 1 D. for the μ_{CH} .

68 pages. \$1.00. MicA54-1687

**STRUCTURES AND π -ELECTRON SPECTRA:
TRIPHENYLMETHANE DYES**

(Publication No. 8353)

Catharine Elizabeth Looney, Ph.D.
University of Washington, 1954

Transition energies, intensities, and polarizations have been established experimentally for a group of related triphenylmethane dyes.

The theory of the structure representation has been applied to the spectra of these compounds and four energy levels are considered for each dye. It is found that the changes in these levels are explained quantitatively by the variation of a single parameter in the structure representation.

The structure representation theory of intensities is presented and the predicted transition moments are found to be in agreement with experiment.

74 pages. \$1.00. MicA54-1688

**THE HOMOGENEOUS CATALYSIS
OF THE THERMAL TRANS-CIS ISOMERIZATION
OF DIDEUTEROETHYLENE**

(Publication No. 8354)

Franklin Sittig Looney, Jr., Ph.D.
University of Washington, 1954**PART ONE****STEREOCHEMISTRY OF REDUCTION
OF ACETYLENIC BONDS**

The reduction of acetylenic compounds, chiefly acetylene, d_2 , with various reducing agents has been studied. It was found contrary to evidence in the literature, that reduction with zinc-acid couples gives rise only to cis reduction and not trans. The same result was found for magnesium. Some possible explanations for this finding are presented. Copper activated zinc also gave cis reduction by which means it was found possible to prepare large quantities of pure cis-ethylene, d_2 . It is proposed that reduction with promoted zinc-acid couples are catalytic in nature. It is shown that the mechanisms of chemical reduction postulated by Farkas and Wheland are incorrect.

PART TWO**ISOMERIZATION STUDIES OF ETHYLENE, D_2** **Section A. Thermal Cis-Trans Isomerization Studies**

A brief study of the thermal cis-trans isomerization of ethylene, d_2 was made between the temperatures of 504.4° C and 544° C at a constant concentration of 7.6×10^{-7} moles/cc. of ethylene in a fused quartz reactor. It was found that the rate of cis-trans isomerization of ethylene, d_2 was essentially equal to the rate of trans-cis isomerization reported by Douglas.

Section B. H_2S Catalyzed Isomerization of Trans-Ethylene, d_2

A brief investigation of the isomerization of trans-ethylene, d_2 catalyzed by 0.2 mm. and 1.0 mm. of H_2S was made with a constant pressure of 2.5 cm. of ethylene in a fused quartz reactor. It was found that in the temperature region of 230-400° C reproducible results could not be obtained. An approximate activation energy of 10.7 kcal. was obtained with 0.2 mm. of H_2S . The presence of induction periods, the irreproducibility of results and the extremely low activation energy indicate that heterogeneous reaction is occurring.

Section C. Nitric Oxide Catalyzed Isomerization of Trans-Ethylene, d_2

The nitric oxide catalyzed isomerization of trans-ethylene, d_2 was investigated with nitric oxide pressures between the limits of 0.98 and 12.7 cm. and ethylene pressures of 1.6 to 11.0 cm. The temperature range investigated was 561.2-682.7° K. Studies performed in a packed reactor indicated that the reaction was completely homogeneous in a fused quartz vessel. The reaction was found to be first order with respect to ethylene and nitric oxide throughout the range investigated. Polymer formation and exchange were absent. Investigations of the elementary nature of the reaction revealed that reaction intermediates such as cyclic butane or butene-1 were not possible. Bimolecular activation energies were measured at the two extremes of nitric oxide pressure (0.98 and 12.7 cm.). The results of these measurements gave a low activation energy of 28.3 kcal. and a high pressure value of 27.3 kcal.

Various mechanisms consistent with the experimental kinetics are presented. It is found that reaction might proceed either by rotation about the double bond or involve C-NO bond formation. In the first case the activation energy would correspond to an upper limit for the minimum of the triplet state of ethylene in which case the calculations in the literature for this value are in error. If, however, C-NO bond formation is involved, the theories of Eyring and McConnell concerning paramagnetic catalysis do not apply to NO catalysis as currently believed.

113 pages. \$1.41. MicA54-1689

**EQUILIBRIUM STUDIES
OF IRON BROMIDE SYSTEMS**

(Publication No. 8355)

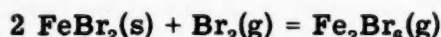
Richard Oliver MacLaren, Ph.D.
University of Washington, 1954

As part of a study of the properties of the iron bromides, an investigation has been made of solid phases intermediate between $FeCl_2$, in which the halogen atoms form a cubic packed layer lattice, and $FeBr_2$, with a hexagonal close packed arrangement. A study of the reaction of HCl and HBr with $FeBr_2$ and $FeCl_2$, indicates formation of a complete series of nearly ideal solid solutions of the iron halides.

Powder patterns of the solids are found to be essentially the same as those of mixtures of the iron halides annealed to 400° C. It has been concluded that two phases of the same composition, each isomorphous with one of the pure halides, coexist over a greater portion of the composition range.

Two additional structures of anhydrous FeCl₂ with random packing of the halogens, and a 2:1 mixture of cubic and hexagonal close packed structures have been identified from powder patterns.

The thermodynamic properties of anhydrous iron (III) bromide vapor have been investigated by a transpiration method in which bromine was passed over solid FeBr₂ heated to a temperature between 200 and 400° C. The amount of iron bromide transported was determined colorimetrically as the iron (II) o-phenanthroline complex with a Beckman (DU) spectrophotometer. Analysis of the data gives conclusive evidence that the gaseous iron (III) phase exists principally as Fe₂Br₆ molecules at the temperatures involved. The equilibrium constants for the reaction:



expressed by the equation of the form:

$$\log K = -\frac{A}{T} + C \quad (1)$$

gives A = 3565 and C = 3.942. The mean heat of reaction is 16.30 kcal.

A study of the gas phase dissociation of Fe₂Br₆ to FeBr₃ in the presence of bromine and solid FeBr₂ has been made from 500 to 670° C in a quartz diaphragm gauge. The results calculated on the basis of equation (1) gives A = 7268 and C = 9.900 with a heat of dissociation of 33.2₄ kcal.

Solubility of the iron (III) phases in liquid FeBr₂ was observed near the melting point of FeBr₂ and analysis of the P-T curves in this region lead to an approximate heat of fusion of FeBr₂ and a melting point of 686° C.

The thermodynamic properties of the iron bromides were calculated at 25° from these results and known thermodynamic values. (The standard state of bromine was chosen as the gas at one atmosphere.)

	ΔH° kcal.	ΔF° kcal.	S° e.u.
FeBr ₂ (s)	-66.0	-56.7	33.68
FeBr ₃ (s)	-74.0	-58.9	43.9
FeBr ₃ (g)	-39.7	-47.3	90.8
Fe ₂ Br ₆ (g)	-113.2	-118.8	149.2

The vapor pressure of FeBr₂ has been measured from 400 to 640° by the transpiration method with argon as the carrier gas. Use of the colorimetric technique enabled measurement of pressures as low as 10⁻³ mm. Comparison of these results with quartz diaphragm gauge measurements from 600 to 900° C indicates that little if any association of gaseous FeBr₂ occurs. The results of the two methods, expressed in the form of equation (1), give A = 10,294 and C = 12.045 for solid FeBr₂ and A = 6912.5 and C = 8.540 for liquid FeBr₂. The heats of sublimation

and vaporization of 47.08 and 31.62 kcal. respectively, give a heat of fusion of 15.5 kcal. and a triple point of FeBr₂ of 691°. A separate determination of the triple point of FeBr₂ of 689.0° was made by a differential thermocouple measurement.

The results of a study of the reaction between Fe₂O₃ and HBr indicate that several equilibria exist simultaneously in this system at temperatures between 100 and 497° C.

127 pages. \$1.59. MicA54-1690

HEATS OF IMMERSIONAL WETTING OF SOLID SURFACES IN LIQUIDS

(Publication No. 8775)

George Jamison Young, Ph.D.
Lehigh University, 1954

The heat of immersion, which is the heat effect resulting from the wetting of a plane solid surface by immersion into a liquid, has been studied for a variety of systems. Nevertheless, discrepancies between reported values have led to considerable confusion when an orderly accounting of the available data is attempted. Work undertaken in this Laboratory sought to provide a critical survey of existing heat of immersion data in the literature and to begin to provide an organized and comprehensive study of this portion of surface chemistry.

The thermodynamic relations between the adsorption and immersion processes were developed and the errors determined in calculating thermodynamic functions from each type of data. The asbestos-water system, which exhibits no contact angle, was selected for this study. It was concluded that thermodynamic functions calculated from heat of immersion data were considerably more reliable than the same functions calculated from adsorption data alone. Comparisons were made of several spontaneous wetting systems.

In a further consideration of systems exhibiting no contact angle, i.e. spontaneous wetting systems, studies were conducted of the immersion of solids in liquid nitrogen. A calorimeter was designed for this purpose. It was found that the heat of immersion values in liquid nitrogen were approximately the same for the different solids investigated. The value of the heat of immersion for the magnesia-nitrogen system was also calculated from adsorption data; good agreement was found between the calculated and experimental values.

Systems exhibiting finite contact angles adsorb only small amounts of the vapor of the wetting liquid. For this reason, reliable thermodynamic functions for the adsorbed state cannot be calculated from adsorption data. The Graphon-water system, which exhibits a finite contact angle and which is typical of these systems, was studied and the thermodynamic functions of the adsorbed state were calculated from heat of immersion data and a single adsorption isotherm. The unusual result was found that the heat of adsorption was less than the heat of liquefaction of water for

this system. Finite contact angle systems were contrasted with systems exhibiting no contact angle.

To determine the influence of the nature of the solid surface on the heat of immersion and to examine the constitutional effects of the wetting liquid, the immersion of two contrasting solids, rutile which possesses a heteropolar heterogeneous surface and Graphon which presents a homopolar homogeneous surface, was studied in a series of organic liquids. The results were as follows:

1. Chain length of the wetting liquid had little effect on the heat of immersion.
2. Chain branching had little influence on the heat of immersion except for the size consideration of the molecule.
3. The heat of immersion for the heteropolar rutile surface increases strongly with increasing polarity of the molecule.
4. The heat of immersion of the homopolar

Graphon surface is approximately the same regardless of the nature of the polar group.

In addition, a relationship was developed between the dipole moment of the molecule and the heat of immersion which allowed an approximation of the force field of the rutile surface. From this value of the force field, the distances of approach of a dipole to the rutile surface was calculated.

In most practical applications of heat of immersion studies, pure one component liquids are rarely encountered. An equation was developed which expresses the total heat effect on immersing a solid into a solution in terms of the heats of immersion of the individual components and a heat term due to dilution effects. This equation was applied to the idealized system: Graphon in water-butanol. Exact agreement was found between calculated and experimental heats of immersion for this system.

109 pages. \$1.36. MicA54-1691

DOMESTIC SCIENCE

A HISTORY OF THE PROGRAM OF VOCATIONAL HOME ECONOMICS IN THE SECONDARY SCHOOLS OF MICHIGAN 1917-18 THROUGH 1952-53

(Publication No. 8505)

Rosalind Blue Mentzer, Ph.D.
Michigan State College, 1954

The purpose of this study was to trace the history of vocational home economics in the secondary schools of Michigan from its beginning in 1917 to the end of the fiscal year June 30, 1953. The data were obtained from legislative acts, Congressional Records, annual reports of the state supervisor and of the state superintendent of public instruction in Michigan, books, bulletins, periodicals, other published and unpublished materials, and interviews with persons who have participated in the program in a professional way.

A review was made of the early history of home economics in the United States and of its beginning in the schools of Michigan. The history of legislation providing for vocational home economics in the secondary schools of the United States was compiled. Several aspects of the program in Michigan were studied including supervision and in-service training of teachers, curriculum and method, equipment for departments of vocational home economics, and the preparation of teachers.

Among the more important findings of this study, the following may be mentioned:

1. Legislation seems to have provided an incentive for the development of vocational home economics in secondary schools of Michigan. Funds have been provided for salaries of teachers from local, state, and federal sources with the greatest amount being provided from local sources. There has been an increase in number of programs in vocational home economics in secondary schools from five in 1917-18 to two hundred seventy-seven in 1952-53.

2. State supervisors and an itinerant teacher trainer provided leadership in the development of the program in secondary schools. During the last fifteen years covered by the study there appeared to be a trend toward more democratic methods in supervision.

3. There was an increase in number of stated goals as the program developed accompanied by an increase in phases of subject matter recommended for study. Curriculum and method appeared to have been influenced by state and regional conferences, visits to schools, bulletins, and school visitation. The depression and World War II seemed to have influenced changes in curriculum.

4. Trends in equipment for departments of home economics appeared to be from heavy, immovable furniture to light, durable furniture that could be adapted to several uses. There was also emphasis on

selecting and arranging furnishings so that rooms would appear home like.

5. Changes in the program for training teachers of home economics have included an increase in the number of credits required in education and a redistribution of credits required in home economics and related subjects. There has been less emphasis on "Food" and "Clothing" and increased emphasis on "The Family" and "Housing." There has been a reduction in science credits and the addition of social science as a required field of study.

Recommendations:

As a result of this investigation it was recommended (1) that there be a state-wide study to determine the needs of pupils in the field of home economics to be used as a basis for planning goals for the state program; (2) that a study be carried out to determine the housing and equipment most effective for teaching home economics; (3) that the history of the Michigan Home Economics Association be studied and written; (4) that the same be done with the history of part-time schools and adult programs in home economics; and (5) that more adequate records be kept of several aspects of the program.

347 pages. \$4.34. MicA54-1692

THE EFFECT ON SULFUR METABOLISM IN WOMEN OF VARYING THE SULFUR INTAKE BY PROVIDING DIFFERENT LEVELS OF PROTEIN INTAKE AND BY GIVING A METHIONINE SUPPLEMENT AT EACH LEVEL OF PROTEIN INTAKE

(Publication No. 8476)

Norma Oresta Thor Ottoson, Ph.D.
University of Minnesota, 1954

A balance study (Experiment I) was carried out with sulfur as the critical element, in which a group of subjects was given a controlled diet supplying approximately 50 gm. of protein for a period of three weeks. Food and excreta were analyzed, according to the method of Benedict as modified by Denis, in order to establish the sulfur metabolic picture on a constant intake.

The following year a second group of subjects was given a diet containing varying amounts of sulfur (Experiment II). Each metabolic period was one week long and the experiment was continued for four consecutive weeks. The sulfur content of the diet was varied; first, by providing a diet which contained 32 gm. of protein and which furnished 400 mg. of sulfur (Period I), second, by adding 480 mg. of DL-methionine to this diet which increased the sulfur intake to 480 mg. (Period II), third, by increasing the protein content of the diet to 50 gm. which provided 660 mg. of sulfur (Period III), and fourth, by adding 480 mg. of

methionine to the diet in Period III, which increased the sulfur intake to 760 mg. (Period IV). Sulfur balances were determined as in Experiment I and a partition of urinary sulfur was carried out according to the method of Folin.

During Experiment I the subjects were essentially in equilibrium. However, a sulfur intake of 640 mg. per day was not sufficient to maintain all of the subjects in positive balance.

Although a negative sulfur balance might have been expected during Period I of Experiment II, two of the subjects were in positive sulfur balance. During Period II, three subjects were in positive balance so the picture is essentially one of equilibrium, with a mean of a minus 6 mg. of sulfur. When a diet containing 50 gm. of protein was provided (Period III), all of the subjects were in positive sulfur balance, the mean retention being 75 milligrams. When this diet in its turn was supplemented with methionine, again all subjects were in positive balance. The mean retention (86 milligrams) was only slightly higher than that observed for Period III. Apparently, when a diet containing 32 gm. of protein is consumed, the sulfur from a methionine supplement tends to bring the

subjects into equilibrium. Supplementation of a diet containing 50 gm. of protein with methionine does not increase appreciably the retention of sulfur.

The range of the percentages of sulfur absorbed is small, 82 to 90 per cent of the intake, and indicates that at all levels of sulfur intake most of the sulfur is absorbed whether it occurs in the bound form in food or in the form of the free amino acid.

During Periods I and II, the low protein content (32 grams) apparently was of greater significance in determining the sulfur balance than the methionine content of the diet, since 1.28 gm. of methionine was not sufficient to maintain sulfur equilibrium in all of the subjects. On the other hand, 1.3 gm. of methionine resulted in positive sulfur balances when the diet supplied 50 gm. of protein.

Results from the partition of urinary sulfur indicate that the inorganic sulfate fraction of the urine varies with the sulfur intake, whereas the organic fraction remains relatively constant. Apparently, methionine sulfur is absorbed and oxidized by the body to the same extent as the sulfur from food.

123 pages. \$1.54. MicA54-1693

ECONOMICS

ECONOMICS, GENERAL

THEORY AND PRACTICE OF MINIMUM WAGE LEGISLATION: THE MASSACHUSETTS EXAMPLE

(Publication No. 8625)

Ralph Jonathan Chances, Ph.D.
Columbia University, 1953

In 1912 Massachusetts passed the first minimum wage law in this country. The feature distinguishing it from other such American laws was that no Bay State firm was compelled to obey decrees. Under this act decrees were issued for many manufacturing industries and a few others, notably retail stores.

Heavy pressure led to addition of a compulsory feature in 1934 under which fines or imprisonment comprise the sanction. Orders are issued by the Minimum Wage Commission for an industry or group of occupations (a) upon recommendation of a wage board and (b) following public hearings at which all interested parties are permitted to speak on the questions involved.

Under the 1934 law the Commission developed its program in several stages.

1. Initially new orders were issued for all fields with old nonmandatory decrees, despite the fact that this did not represent the most judicious use of its time and money.

2. It turned to nonmanufacturing industries after the manufacturing area was taken over by federal law in 1938.

3. Beginning in 1945 new wage boards were established to revise rates upward to conform to changed economic conditions and to expand the fields of coverage to industries not previously included.

4. Finally, it undertook to raise orders to 65¢ in 1950. This followed passage of a law which set this rate as a minimum for all workers in Massachusetts unless an existing wage decree provided for less. The Commission felt its action necessary because almost all its decrees did in fact contain lesser amounts.

As one might expect, the wage boards spend much time on the question, "How high should the legal minimum be?" The arguments used by a given side, labor or management, in support of its idea of a proper rate are essentially the same ones that appear in collective bargaining negotiations. In public discussion much has been made of the living wage and of the need to tie minimum wages to the cost of living. In board meetings a good deal of lip service is paid to these criteria, but almost no rates are actually set with them as guides. Wages set by other bodies enter, on the contrary, much more seriously. Prevailing rates too play an important role, but less frequently. This criterion has weighed very heavily with advocates of this form of legislation and if followed can be expected to place a severe financial strain on few firms in any industry.

The effects of a legal minimum on the wage structure are examined analytically and statistically and, briefly, it may be said that a low rate leaves the structure almost unaffected, whereas higher rates

lead to wage compression, i. e., the lower rates in the distribution gain on those above.

Study of the proposition that a legal minimum leads to unemployment reveals that there will usually be little tendency in that direction because enhanced productivity may frequently be entailed, the enforced cost increase is generally small (under the types of minimum wage laws in this country it is rare that the cost increase is substantial) and because of the shapes of cost curves that are probably widely experienced. Study of available statistics does not appear to disclose any severe unemployment resulting from operation of the Bay State enactment.

The work concludes with a brief examination and appraisal of what has been done in Massachusetts with various subsidiary questions: the weekly minimum; the statutory rate; premium rates for overtime; the experience differential; and tips.

254 pages. \$3.18. MicA54-1694

WARTIME CONTROL OF GRAIN PRICES IN THE UNITED STATES

(Publication No. 8470)

George Montgomery, Ph.D.
University of Minnesota, 1954

This study analyzes the World War II anti-inflation program as applied to grain prices. The policies, administrative organization, and the operating procedures involved in fixing maximum ceiling prices are examined. The organization and the procedures involved in fixing grain prices during World War I are compared with the program of direct legal action during World War II.

Among the phases of the anti-inflation program to which the specific study is directed are: the legislative authority for price action, the philosophy and attitudes of persons responsible for developing the program, the method of determining the level of maximum prices, the administrative organization, the qualifications and tenure of administrative personnel, the influence of price controls on market structure and price relationships, the effectiveness of operating procedures, the timing of price actions, and the manner of termination of controls.

Difficulties involved in establishing legal maximum prices for grains are indicated by discussion of situations characteristic of the system of pricing and distribution of grains. Among these are: seasonal price variations and area price relationships, variations in margins for handling grain as influenced by location and size of marketing units, and the influence of source of supply and method of transportation on prices in specified markets. The problem of translating established market procedures into legal terminology is illustrated by the interpretations and subsequent amendments of the section on the corn price regulation dealing with discounts for high moisture content.

Other phases of the program which are analyzed include: the separation of administrative authority over prices and over supplies, the parallel or dual

authority of the legal and the pricing staff of OPA, the lack of experienced staff and procedural arrangements for interpretation of price actions, and the effect of these policies and procedures on the degree of cooperation and compliance on the part of producers and merchandisers of grain.

213 pages. \$2.66. MicA54-1695

USING FARM RECORDS IN DECISION MAKING IN LIVESTOCK PRODUCTION

(Publication No. 8492)

Bernard Freeland Stanton, Ph.D.
University of Minnesota, 1954

This study is concerned with the process of decision making by farmers when organizing their production. It relates particularly to the possibilities of using more effectively information supplied by farm account records in making production decisions.

Three questions are examined:

- (1) Is the method of comparisons useful in making production decisions?
- (2) Can this method be improved?
- (3) If so, what specific suggestions can be offered for the improvement of this approach in decision making?

A specific area in which the method of comparisons is used was chosen for intensive study. This was the analysis of livestock production made for members of the Minnesota Farm Management Services. In this way individual farm records over a period of years became available for testing hypotheses, insofar as this was possible.

The ways in which the method of comparisons is used were explored. Its major assumptions, advantages, and limitations as a method of decision making were set forth. This appraisal suggested two more specific hypotheses for investigation and testing. First, it was asserted that measures using available farm record data can be devised which more nearly estimate actual profitability and efficiency in the use of resources than those which are used at present. Second, it was asserted that standards and averages used for purposes of comparison can be constructed which approximate more closely conditions on individual farms.

The following conclusions were reached in relation to decision making in livestock production using the method of comparisons:

- (1) Return over feed cost per unit is a more accurate indicator of profitability than returns per \$100 of feed, especially when feed makes up less than 75% of total costs.
- (2) From available alternatives the most useful estimate of profit per unit of production is obtained by subtracting from return over feed cost per unit an average or modal expenditure for all inputs other than feed. This constant can be obtained annually from detailed accounting records on a small number of farms.
- (3) Returns per \$100 of feed is not as meaningful a measure of feeding efficiency as are the

actual amounts of feed consumed per unit of production.

- (4) An estimate of returns per \$100 of all costs when compared with returns per \$100 of feed is the more meaningful indicator of overall operating efficiency in the use of resources for a given enterprise. This estimate allows direct comparisons to be made between alternative enterprises. An estimate of total costs is obtained in the same manner as when estimating profit per unit.
- (5) An overall index of livestock efficiency based on return over feed cost per unit is a more reliable indicator of success in handling the livestock enterprises than one based on returns per \$100 of feed. The procedure for calculating such an index is demonstrated.
- (6) The cost of providing sets of standards for individual farms, which define the upper limits of efficiency, rates of production, and resource use which are attainable with a given operator's resources, basic set of values and available technology, is prohibitive. The use of averages obtained from groups of farms with similar amounts of resources and rates of production is defended as the most feasible source of standards. Specific suggestions are offered for the dairy, hog, and feeder cattle enterprises.

This study concludes that the method of comparisons is a useful method of decision making. As an orderly procedure for determining where changes should be considered in the organization of production it will continue to be used on farms. Suggestions for improving these procedures form the core of the investigations. 177 pages. \$2.21. MicA54-1696

SETTLEMENT AND REPAYMENT POLICIES ON IRRIGATION PROJECTS

(Publication No. 8493)

Harold Ralph Stucky, Ph.D.
University of Minnesota, 1954

The improvement of the financial and social problems in connection with the settlement and repayment policies on both new and old irrigation projects is the subject of this thesis.

Several of the settlement and repayment problems facing the development of irrigation both present and future projects are described. Some policies which have been followed and still are being followed, which have not worked to the advantage of the settlers on the project, are pointed out. A set of policy recommendations are outlined which would help to improve the settlement and repayment conditions on present and future projects.

This study deals with all types and sizes of irrigation project whether developed by private individuals or companies, state governments, the federal government, or by a combination of these units.

Because the Federal Bureau of Reclamation has developed a large number of projects and, according

to present plans, will develop many more, considerable attention is focused on the settlement and repayment policies of this agency.

The study is limited to settlement and repayment policies and to factors in the physical characteristics or the design which have a bearing on the successful settlement and repayment on various sizes and types of projects.

Among the settlement policies considered are:

- (1) Selection of the project area, (2) block-type project vs. a dispersed-type, (3) private land development contrasted with that of public land, (4) size of farms, (5) selection of settlers, (6) investments in irrigation, (7) excess land, (8) credit requirements and availability, and (9) services needed by irrigation project farmers - Extension work, research work, Soil Conservation and other services.

Repayment policies discussed are: (1) Federal repayment policies, (2) length of time and variations in federal contracts, (3) repayment considerations on multiple-purpose projects, (4) methods of assessing construction and operation and maintenance charges, (5) utility-type repayment plans, and (6) repayment through conservancy districts.

The type of leadership in the irrigation program development is an important factor in settlement and repayment problems. Various types of leadership which might be adopted are outlined, such as use of: (1) National committees, (2) federal departments, (3) river basin authorities, (4) interstate compacts, (5) river basin commissions, (6) state institutions, and (7) local organizations and individuals.

The recommendations point out the need for a more specific and thorough national resources development policy, which would include: (1) A complete inventory of our natural resources, to be used in selecting their best uses, and (2) a determination of the proper project design to best serve the nation and the farm interests. Some other recommendations are: (1) That a basic soils survey be required prior to the development of irrigation projects, (2) that the 160-acre limitation be reconsidered on the basis of the amount of land required to provide an adequate living for a farm family, (3) that repayment be based on the basic soil survey with both construction charges and operation and maintenance payments varied in the contract according to the productivity of the land as indicated by the soils survey, (4) that investments in irrigation and credit for development of irrigation be studied and correlated, and (5) that research and education is lacking on all irrigation projects, but especially so in the pre-construction, construction and the settlement periods on new projects. This lack of research and educational work should be corrected by action of the Congress and the Land Grant Colleges to improve the settlement and repayment experience of irrigation projects and of the individual farmers.

210 pages. \$2.63. MicA54-1697

ECONOMICS, COMMERCE-BUSINESS

ECONOMIC EDUCATION IN INDUSTRY

(Publication No. 8448)

Blaine McLyman Cooke, Ph.D.
University of Minnesota, 1954

Economic education in industry is a post World War II phenomenon which has involved substantial investments of corporate time and money and which has exposed very large numbers of people to "training in economics." A particularly interesting facet of the movement is the so-called "economic education program," a course of instruction prepared at the expense of an employer for presentation to his employees. Such programs fit readily into a three-fold classification: (1) academic programs, (2) evangelistic programs and (3) company-oriented programs.

All economic education programs seek to influence employees' opinions or attitudes in directions conceived to be favorable to enterprise capitalism. It is possible, however, to identify three methods of seeking this goal. These are: (1) "selling" free enterprise, (2) attempting to instill analytical competence with respect to economic problems, and (3) attempting to enhance employee-management rapport within the firm. Of these only the last can be construed to have economic meaning; when it employs this method, economic education can be interpreted as a functional aspect of the intra-firm communication process.

The economic content of programs of other than the company-oriented type tends toward distortion, over-simplification and irrelevance. That of company oriented programs is by definition relevant and meaningful. But all types of programs project similar economic concepts, among which perhaps the most interesting are competition, profit and capital. The interpretations which these courses place upon economic concepts such as these can usefully be thought of as a source of data with respect to the economic orientation of the executive.

Attempts to measure the effectiveness of economic education in industry have in general been characterized by inadequate designs and primitive analysis. Hence it is not possible from existing data to determine the degree to which such programs are capable of influencing attitudes. However, the results of an experiment in measurement technique, conducted by the author, suggest that somewhat more sophisticated methodologies coupled with careful experimental design can produce dependable and useful evaluations. It appears further that the company-oriented approach to economic education in industry provides a simpler measurement problem than do other approaches.

These several approaches lead to the general conclusion that economic education of employees can make economic sense if in terms of both content and purpose the process is conceived as one specialized to the individual firm.

173 pages. \$2.16. MicA54-1698

SOME RELATIONSHIPS BETWEEN THE
VOLUME OF SALES OF GREEN GIANT
BRAND PEAS AND ADVERTISING IN
SEVENTY-FOUR MARKET AREAS

(Publication No. 8472)

James Joseph Mullen, Ph.D.
University of Minnesota, 1954

This investigation is an attempt to measure the effects of a number of variables upon the geographical sales of Green Giant Brand Peas. Because the Green Giant Company uses advertising as its major sales force, and because company officers believe their advertising to be highly effective, there was expected to be a highly significant relationship between advertising volume and sales volume in the various market areas.

The simple correlation coefficients obtained using these two variables in each of the years 1946 to 1950 made it clear that there were other variables operating which were more important in explaining geographical sales differences than the volume of advertising.

Before any attempt was made to find the sources of the unexplained variance, several other checks were made to test the stability of the sales-advertising relationship. Among these were correlations between sales and magazine advertising only, correlations between sales in 1950 and advertising in 1949 and 1950, and correlations between sales and the ratio of Green Giant-to-total canned pea sales. In each of these cases, there was nothing to indicate that the relationship was higher or lower than that measured originally.

Following this procedure, an attempt was made to locate other possible explaining variables. It was recognized that there could be factors which are not readily measurable which might cause geographical differences in the sales of Green Giant Brand Peas, but that it was necessary to confine the search to variables for which measures exist. Several factors were found which might logically contribute to sales variation and which could be measured objectively. Included were the following:

1. The level of income prevailing in each territory. Actually two such measures were used; per cent of families with incomes less than \$2000 per annum, and per cent of families with incomes over \$5000 per annum.
2. The rate of population growth. The effects arising from a "boom town" atmosphere might include a somewhat different pattern of consumption expenditures.
3. The proportion of Negro population. Negroes have been thought to have different consumption patterns from whites.
4. Per capita pea consumption in each territory.

These variables were added to advertising to determine through multiple correlation analysis their combined effect upon geographical purchases of Green Giant Peas. Again, the relationship was much too low to represent more than a fractional explanation of variance.

The partial correlation coefficient between each of the variables and sales was also uniformly low. Of them, only advertising seems to offer much more than a chance relationship. Even then, the advertising variable explains only a tiny fraction of total variance.

Obviously, there are other variables not included in this analysis which contribute roughly twice as much to variance explanation as the variables tested. Of those which might logically contribute to such explanation, two seem to offer the best possibilities. They are: (a) broker efficiency and (b) local bias in the acceptability of large-size canned peas. Unfortunately, neither of these is at present measurable. There are techniques which might be used to set standards of broker efficiency and to measure degrees of acceptance of a brand. However, both are outside the scope of this investigation. It is hoped that later these factors might be checked.

The final conclusion drawn from this study is that the method used for analysis of the sales-advertising relationship cannot be given general recommendation unless other variables can be found which, when added to the variables used, can explain a much greater portion of total variance.

54 pages. \$1.00. MicA54-1699

THE IMPACT OF INFLATION ON CORPORATE MONETARY ITEMS

(Publication No. 8394)

William Andrew Paton, Jr., Ph.D.
University of Michigan, 1954

It is the objective of this study to measure and appraise the impact of inflation on corporate monetary items. Seventy-three non-financial corporations are studied for the Dec. 31, 1940 - Dec. 31, 1952 period. Fifty-two companies are analyzed in order to measure the impact of inflation on the short-term monetary items, and this analysis constitutes the major portion of the thesis; a twenty-one company sample is the basis of a one-chapter discussion of the impact of inflation on long-term debt.

Using the annual financial statements of the fifty-two companies as source material, the Dec. 31 short-term monetary asset and short-term monetary liability amounts are calculated for each year of the Dec. 31, 1940 - Dec. 31, 1952 period. Short-term monetary assets consist primarily of cash, U. S. government securities, and current receivables; short-term monetary liabilities are comprised of accounts, notes, and expenses payable, federal income tax liabilities, and other current obligations. The yearly changes in the short-term monetary items, along with the Dec. 31, 1940 short-term monetary item amounts, are converted into Dec. 1952 dollars, the Consumers Price Index (1935-39 = 100) being employed in this conversion process. The converted balances of the short-term monetary assets and liabilities are calculated, and these balances are compared to the actual Dec. 31, 1952 short-term monetary asset and liability amounts to determine for

each company the loss on the monetary assets and the gain on the short-term monetary liabilities.

A study of the fifty-two sample companies reveals a number of significant facts. Only two of the companies show a net gain on the short-term monetary factors over the Dec. 31, 1940 - Dec. 31, 1952 period; in each of the other fifty cases, the loss on the monetary assets exceeds the gain on the short-term monetary liabilities, and a net loss is sustained. And these losses are typically quite large; thirty-six of the fifty-two companies exhibit an average loss rate, an average annual erosion of the purchasing power invested, of 5% or more. The median average loss rate is between 5.4% and 5.5%, and forty of the companies have an average loss rate in the 4.6%-5.9% range.

The Securities and Exchange Commission estimates of the working capital of "all" United States corporations (excluding banks and insurance companies) are employed in the process of measuring the impact of inflation on the short-term monetary items of "all" corporations. "All" corporations sustained a net loss of over \$12.5 billion (Dec. 1952 dollars) on the short-term monetary factors over the Dec. 31, 1940 - Dec. 31, 1952 period - a very substantial loss. The average loss rate for "all" corporations is 5.1%, very close to the median average loss rate of the fifty-two company sample.

An analysis of the patterns of change of the monetary assets and the short-term monetary liabilities of the individual sample companies over the twelve-year period indicates that in the typical situation there is an expansion of both monetary assets and short-term monetary liabilities, with the net monetary fund increasing or remaining fairly constant. And twenty of the fifty-two companies show an increasing ratio between short-term monetary liabilities and monetary assets; this trend is particularly noticeable in the 1946-1952 period. In a majority of the individual company situations, however, there is no evidence of such a trend, and it appears that corporate management has not been sufficiently aware of the impact of inflation on the monetary fund.

This study demonstrates that the impact of inflation upon the monetary items of business enterprises is a major phenomenon, and that this phenomenon should be more widely recognized and more carefully appraised by corporate accountants and managements.

221 pages. \$2.76. MicA54-1700

CORPORATE REPORTING OF SPECIAL INCOME ITEMS

(Publication No. 8426)

Wendell Piggott Trumbull, Ph.D.
University of Michigan, 1954

This is a study of accounting thought and practice with regard to special items of income which are occasionally or regularly excluded from reported earnings by large American corporations. The recommendation, often made, that published income statements reflect all income items given accounting recognition is supported. However, the related

recommendation that all income recognized be invariably included in the figure of net earnings is not supported in some circumstances. The general purpose of the study is to consider the nature of the continued opposition to the all-inclusive income statement and such other accounting matters as might lead to more consistent and informative reporting of special income items (frequently called "extraordinary" income items). Although substantial progress has been made, it is widely recognized that too much diversity still remains in this area of income reporting.

Chapter I summarizes the general problem, defines terms, and includes a preliminary statement concerning the two alternative all-inclusive standards. Chapter II contains a general discussion of "disclosure" as the primary function of corporate financial statements. The view is developed that when the income report is made highly informative "distortion" and the "avoidance of misleading inferences" are not final criteria of good income reporting. The following points are emphasized with respect to the reporting of special income items; (1) the entire income report rather than the figure of net earnings is the final objective of the income-determination process; (2) clear description and sound classification within the income statement are the leading accounting means of dealing with nonrecurring items; (3) selective concepts of income reporting are not in agreement with the view that the guiding objective of financial statements is informative disclosure; (4) the final step of evaluating the accounting data in the annual report is a subjective matter which should be left to the judgment of owners and prospective owners of corporate securities. Consequently it is believed that the omission of income items from the income statement is not basically an accounting prerogative.

Chapters III, IV, V, and VI are summaries of accounting thought since the later part of the nineteenth century as related to the exclusion of special income items from reported earnings and from the income statement. Chapter III is concerned with the early view that net income should measure the annual earnings available for dividends. Chapter IV is a summary and critique of the "earning-capacity" doctrine. Chapter V is a résumé of various "operating" doctrines as sources of special items. Chapter VI traces the ebb and flow of accounting thought since 1930 with regard to the presentation of special items of income in a separate surplus statement.

Chapters VII and VIII are analyses of actual corporate reporting. In the first of these chapters the prior-year income items in one hundred and ten annual reports for 1952 are tabulated and in many instances individually considered. Examined in some detail are tax carry-back credits and other prior-year tax adjustments, gains and losses from the disposition of long-term assets, and charges and credits arising from changes in accounting method. Alternative forms of presentation are illustrated in unusual situations. Chapter VIII is a detailed case study of the accounting for \$768,000,000 of so-called intangible assets in the annual reports of the United States

Steel Corporation from 1901 to 1938. The contents of the original property account are estimated; all eliminations of non-tangibles are classified and traced; and, finally, an over-all estimate of the income exclusions arising from this source is made.

A summarizing chapter and an extended bibliography are included. 260 pages. \$3.25. MicA54-1701

ECONOMICS, FINANCE

THE BANK FOR INTERNATIONAL SETTLEMENTS RECONSIDERED

(Publication No. 8826)

Henry Hans Schloss, Ph.D.
Columbia University, 1953

The origin of the Bank for International Settlements can be traced to two separate developments. First, the history of proposals for some international institution to aid in the stabilization of currencies, is a long one. In the nineteenth century, it found expression in the informal emergency aid granted by central banks to each other, and the operation of various monetary unions. In this century, there have been innumerable proposals for some kind of international monetary institution, and practically all financial and economic conferences held during this century recommended such action.

Second, the German reparation payments proved to be a troublesome problem. In 1929 the formation of an international financial organization was proposed to take the reparations problem out of politics. At this point the two ideas merged. In other words, the reparations problem provided the immediate stimulus for the establishment of an international financial institution. The statutes of the bank make it clear that the non-reparations functions of the bank were at least equal to, if not more important than, its work in connection with reparations.

The Bank was organized as a bank of central banks, primarily of Europe (Japan having dropped out after World War II, and the United States never having taken up the place provided for it). Its powers were carefully circumscribed to avoid any likelihood of it interfering with the members' national sovereignty.

In its capacity as a trustee for the reparations payments, it has no power to prevent the final collapse of these payments with the Hoover Moratorium and the unratified agreement of Lausanne. In the field of international financial stability, it was unable to cope with the fundamental disturbance in the international financial structure of the early 1930's, as any international institution is bound to fail unless it is given power to correct the basic maladjustment within the member countries; i. e., unless sovereignty in matters of credit and monetary policy are transferred to it.

Nevertheless, the Bank for International Settlements was, and still is, able to perform valuable services. It has facilitated informal cooperation of

central banks by such means as the monthly meetings of the governors of the central banks; it has provided valuable services as an international trustee for such transactions as the transfer of the Saar from France to Germany in the 1930's, as the trustee for international loans, and the agent for the European Payments Union; it has provided research services such as its annual reports and its press review, which are of the highest calibre; it has provided such banking services as a valuable gold clearing; and it had aided central banks in coordinating its activities by such means as standardizing the type of gold bars acceptable to central banks.

The Bank has been criticized severely for essentially three reasons: One, it has been attacked as having been pro-German, although this study has not substantiated these charges. The Bank had, however, been caught in the political turmoil of the late 1930's. Two, as an institution of central banks advocating "sound" monetary and credit policies, it has been attacked by those preferring another approach to the solution of economic problems. Third, it has been attacked by those who oppose all regional financial arrangements.

Despite the resolution passed at Bretton Woods to dissolve the Bank for International Settlements, the Bank has again become increasingly active, and continues to provide its much valued services. With the reemergence of monetary policy and the continued use of its services - combined with the fact that it is self-supporting - the future of the Bank for International Settlements seems assured.

273 pages. \$3.41. MicA54-1702

THE TAXATION OF INSURANCE COMPANIES, BANKS, AND BUILDING AND LOAN ASSOCIATIONS IN MICHIGAN

(Publication No. 8511)

Arthur Merle Taylor, Ph.D.
Michigan State College, 1954

From 1949 to 1953 the General Fund of the State of Michigan incurred a mounting cumulative deficit. The result was the enactment of more than six new tax measures in 1952 to be to an important degree upon financial institutions because of their vast resources. The purpose of this inquiry is to evaluate the present tax system and propose alternative courses of action to attain desired tax policy objectives.

The procedure followed was to study the literature in the field of state finance and, on the basis of the findings, to set forth the premise that the Michigan tax system for insurance companies, banks, and building and loan associations is inequitable and inefficient. Further research was conducted by obtaining personal interviews with tax officials, studying the files of administrative agencies and analyzing compiled tax agency reports.

It was found that financial institutions enjoy special tax privileges not extended to other types of businesses; that inequities exist between the tax

burdens on banks, insurance companies and building and loan associations and; that the problem of administering this tax system is complicated by the number of tax bases and rates, the number of administrative agencies and the frequency of exemptions.

It is the hypothesis of this study that these deficiencies may be overcome by levying a franchise net income tax in lieu of certain existing taxes, the rate to be equalized between types of businesses and the revenue collected by one central agency. The general characteristics of such a plan are presented in the final chapter.

An alternate proposal for reducing inefficiencies and inequities is also outlined. This proposal would introduce no taxes with which the state has had no experience but is based on revising and extending existing tax statutes. 189 pages. \$2.36. MicA54-1703

AN EVALUATION OF THE APPLICATION OF THE INSURANCE PRINCIPLE IN BANK DEPOSIT INSURANCE

(Publication No. 8528)

Salvatore Valentino, Ph.D.
University of Nebraska, 1954

Adviser: Curtis M. Elliott

The purpose of this dissertation was to evaluate the application of the insurance principle in bank deposit insurance systems. A preliminary analysis of the nature of risk (hazard) revealed that it relates fundamentally to the uncertainty of the occurrence of loss-producing events. The uncertainties were classified as particular hazards - those associated with a static society and being largely measurable - and fundamental hazards - those associated with a dynamic society and being largely unmeasurable. With the advance in knowledge and the accumulation of experience, risks might change categories, e. g., move from the fundamental to the particular class. In our judgment, the risk of bank failure is making this transition.

Analysis of a fundamental method of dealing with risk, the insurance principle, revealed it to contain three essential elements, namely, combination of exposure units, transfer of risk, and accumulation of funds. All programs containing these elements, regardless of outcome, must be considered insurance systems. Insurance deals fundamentally with particular hazards because they comply more satisfactorily with the requirements of an insurable risk, namely, large numbers, definite loss, accidental loss, and avoidance of the catastrophe loss, which requisites were established as the criteria for evaluating insurance programs.

Examination of widely-accepted insurance systems, including life insurance, fire insurance, and accident and health insurance, revealed that no program complies perfectly with the requirements of an insurable risk. All insurance programs pass through an "experimental period," during which time they are

gaining financial strength and experience to comply better with these requisites, loss prevention becoming an important phase of many insurance systems. We believe the present deposit insurance system is passing through this experimental stage.

Analysis of the application of the insurance principle to the risk of bank failure revealed the State deposit guaranty program to be a type of insurance system which failed to comply substantially with the requirements of an insurable risk, particularly the avoidance of the catastrophe loss. Consequently, the program failed before moving beyond the experimental stage. The Federal deposit insurance program was found to conform with most of the requirements of an insurable risk at least as well and in some instances better than other accepted insurance systems. The record of the program revealed its success to date, although it must be considered experimental since it has not yet faced the test of a serious recession. Emphasis upon loss prevention and the handling of distressed banks through the absorption technique has resulted, since 1944, in the elimination

of losses of insured bank depositors. A judgment of how well the program meets the requirement of avoiding the catastrophe loss was based upon a projection of experience during the banking crisis of 1930-1933 period and an examination of some of the encouraging and discouraging factors in the present outlook for handling the problem of the business cycle. A position suggesting that the Federal deposit insurance system probably could successfully cope with a recession comparable to that in 1930-1933 was taken, looking at the problem from an "over-the-cycle" point of view and assuming the program could be sustained long enough to permit realization on salvage values of failed bank assets.

Two policy proposals for strengthening the Federal deposit insurance program were suggested: (1) full coverage for depositors to take advantage of the favorable impact of such a provision on large depositors, and (2) a flexible borrowing authority for the Federal Deposit Insurance Corporation to secure its life during a crisis.

278 pages. \$3.48. MicA54-1704

EDUCATION

EDUCATION, GENERAL

THE RELATIONSHIP OF AUDITORY-VISUAL DISCRIMINATION TO SPELLING ABILITY

(Publication No. 8441)

Ira Edward Aaron, Ph.D.
University of Minnesota, 1954

This study attempted to determine the relative contributions of nine auditory-visual discrimination measures and intelligence in estimating five spelling measures. Five of the auditory-visual discrimination tests were those separate abilities which writers in the area of spelling have indicated are a part of or are related to phonetic ability. These measures were visual analysis of words, recognition of beginning and ending sounds in words, knowledge of sound values of common word elements, word discrimination ability, and spelling of phonetic syllables. A sixth measure was that of intelligence. The remaining four of these tests were hearing tests. One of these was binaural acuity for full frequency range. The other three were measures of binaural acuity for high, medium, and low frequencies.

Spelling words were placed on a phonetic continuum, ranging from those words classified as being purely phonetic in composition to those of non-phonetic composition. This categorization of spelling words was undertaken in order to determine whether or not the auditory-visual discrimination measures were more closely related to the spelling of one type of word than to another. The types of words utilized were those of purely phonetic content, those of almost

phonetic content, those of partially phonetic content, and those of non-phonetic content. A fifth spelling measure combined purely phonetic and non-phonetic words.

The population consisted of the white, fourth grade pupils of the Hall County, Georgia, Public School System for the 1951-52 school year. Six of the twenty-one white schools of the system were selected randomly to participate in the investigation. A total of 203 cases forms the basis for conclusions.

Multiple regression weights for each of the auditory-visual discrimination measures and intelligence were computed for the prediction of each of the five spelling measures. Only three were significantly different from zero at the 1 per cent level. These three, important in predicting each of the five spelling measures, were visual analysis of words, recognition of beginning and ending sounds in words, and spelling of phonetic syllables. Intelligence, though positively correlated with the spelling measures, did not contribute significantly to the multiple regression equations for predicting spelling achievement. The binaural acuity measures did not contribute significantly in estimating spelling achievement.

One of the most clearcut findings in this investigation was that auditory acuity was not significantly related to spelling. However, with few exceptions, the subjects in this study were of normal or near-normal auditory acuity. Within the normal or near-normal range of hearing, increased acuity for low, medium, or high frequencies was not found to be related to spelling achievement.

The fact that spelling of phonetic syllables was the largest contributor to the estimate of the spelling of

non-phonetic words as well as those which were phonetic indicates that phonetic skills may be important in the spelling of all types of words.

As far as the population in this investigation is concerned, certain phonetic skills contributed significantly to the prediction of spelling, even to the spelling of words of non-phonetic content. Another important predictor of spelling success was that of visual analysis of words. This latter test may be referred to as one of structural analysis. Both visual and phonetic skills were found to be related to spelling achievement. This study would lend support to those who favor a varied approach to the teaching of spelling. The findings, however, were concerned with relationships and not with causes.

280 pages. \$3.50. MicA54-1705

OCCUPATIONAL OPPORTUNITIES IN AGRICULTURAL AND RELATED FIELDS AND THEIR IMPLICATIONS FOR AGRICULTURAL EDUCATION OF NEGRO STUDENTS

(Publication No. 8506)

Richard D. Morrison, Ph.D.
Michigan State College, 1954

Purpose. The purposes of this study were (1) to reveal the prevalence of occupational opportunities for Negroes in agricultural and related fields; (2) to determine whether the pattern of occupational opportunities for Negroes varied among the regions of a selected area; (3) to identify agricultural and related occupations in which few or no Negroes were employed; and (4) to determine the levels of training required for occupational success in agricultural and related fields.

Method. Data were collected from 299 Negro county agents and Negro teachers of vocational agriculture in four contiguous states - Alabama, Arkansas, Mississippi, and Tennessee. Prepared questionnaire forms were filled in by respondents in each state at scheduled group meetings during arranged periods. These data were summarized and tabulated to show the prevalence of employment in seventy occupations, and to show to what extent Negroes were employed in these occupations. In addition, decennial census data, 1920-1950, were used from which tables were constructed to show trends in population, land use, land tenure, mechanization, and occupations.

Findings. An increase occurred in the total population during the 1920-1950 period. There was a shift in population away from the rural farm area. The non-white population movement away from the rural farm area reached a peak of 40.9 percent in Arkansas; whereas, the minimum percentage shift, 22.3, occurred in Mississippi. Along with the off-the-farm movement came a decrease in the number of farms, and an increase in the size of farms. Contrary to this reaction, the non-white farmers' farms were approximately the same size in 1950 as they were in 1920. There was a decrease in the number of all tenants in general, but the decrease among non-white tenants was particularly pronounced.

Although farmers had decreased the number of acres devoted to harvested crops, cotton was the leading cash crop in all the selected states except Tennessee. Farmers had greatly increased their ownership in tractors, trucks, grain harvesters, pick-up hay balers, and corn pickers.

Among the major occupations, the highest percentage of gainfully employed Negroes was engaged in agriculture, followed in order by manufacturing and construction, personal service, and trade, finance and insurance.

The questionnaire data showed that productive phases of agriculture provided the largest number of employment situations for Negroes. These employment situations were in the category of farm hands, general farmers, livestock farmers, and tractor operators. Among related occupations, a general pattern prevailed in that the major portion of employment situations for Negroes was realized among the Negro population in agricultural education, such as county agents, and teachers of vocational agriculture.

Respondents reported twenty-eight occupations related to farming in which few Negroes were employed, and eleven in which no Negroes were employed.

There was no evidence found which indicated that the pattern of occupational opportunities for Negroes varied among the four states.

A college education in agriculture was recommended for individuals who anticipated employment in agricultural education, agricultural government work, and other professional agricultural work. There was no general agreement upon the training requirements for agricultural productive occupations; however, short-course training was recommended for individuals who anticipated employment in these occupations but were not interested in a college degree.

249 pages. \$3.11. MicA54-1706

THE SUPERVISED CORRESPONDENCE STUDY PROGRAM AT BENTON HARBOR (MICHIGAN) HIGH SCHOOL

(Publication No. 8921)

Don Wright Nantz, Ed.D.
Bradley University, 1954

The supervised correspondence study program has been in continuous use at the Benton Harbor High School since January, 1923. Its essential motivation sprang from a recognition that the regular college preparatory curriculum helped only those students who enter college. The curriculum did not help the majority of the students who planned to go to work after graduation from high school. The desire to meet the individual needs of these boys and girls inspired the development of correspondence study, under supervision, at the Benton Harbor High School. The purpose of this study is to ascertain how effectively the supervised correspondence program at the Benton Harbor High School is meeting the objectives of the program and the needs of the pupils who enrolled in the various courses in the program.

This study is based upon the statements of opinions, attitudes, and feelings about the Benton Harbor supervised correspondence study program made by former Benton Harbor High School students, who were interviewed, and who had been enrolled in supervised correspondence study courses at the Benton Harbor High School.

In the regular correspondence study, there are two parties concerned, namely, the correspondence center and the pupil. In supervised correspondence study, the two parties are connected by a third party, the supervisor, a competent teacher, who supervises the regular study period of the pupil, offers guidance, information, sources of information, encouragement, and keeps instructional material flowing to the pupil as it is needed.

The Benton Harbor High School has enriched its curriculum with supervised correspondence study to meet the individual needs of its students to the extent that a high school student can take a major, a minor, or a single subject as an elective in any of approximately one hundred vocational fields and thus meet the requirements for graduation. This has been accomplished at a moderate cost to the school and student.

A student enrolled in a supervised correspondence course at Benton Harbor High School studies his correspondence course in the supervised correspondence laboratory. The laboratory consists of study desks, a technical library, experimental equipment, models, mock-ups, audio and visual aids, and sample equipment.

The effectiveness of the program is discussed with the data collected under such headings as (1) number and percentage of boys and girls in the program; (2) reasons for failures and drops; (3) occupations of the interviewees; (4) number of years engaged in one occupation; (5) reasons for enrollment in supervised correspondence courses; (6) reasons for changes of objective and occupation; (7) number of interviewees who received direct help in former and present occupations; (8) how supervised correspondence study helped directly with former and present work; (9) types of help interviewees received from courses; (10) interest in supervised correspondence courses as compared with regular high school subjects; (11) interviewee reactions in regard to the ability of the correspondence school instructor; (12) college attended, major field, years attended, and degree earned by interviewees who attended college; (13) criticisms, suggestions, and comments about the supervised correspondence program.

A composite list of correspondence courses offered by accredited schools indicates the scope of this program. 151 pages. \$1.89. MicA54-1707

MOTOR COORDINATION AS A FACTOR IN READING READINESS

(Publication No. 8409)

Samuel Shepard, Jr., Ph.D.
University of Michigan, 1954

For many years authorities in the field of reading have emphasized that reading is a complex group of skills rather than a unitary item of achievement. Researchers and scholars in the fields of reading and reading readiness have often listed motor coordination as one of these contributing skills.

Purpose. The purpose of this investigation is to determine objectively (1) whether there is a significant relationship between measures of motor coordination and measures of readiness for beginning reading; (2) whether a similar relationship exists between measures of motor coordination and measures of reading, as measured at the end of the first grade; and (3) if such relationship is established, whether measures of motor coordination can be used to predict success or failure in reading with individual pupils.

Design of the Study. Twelve individual measures of motor coordination and a measure of reading readiness were taken on two samples of the population before the subjects began to receive instruction in the regular first grade curriculum. At the end of the first grade, measures were taken of reading achievement. There were 315 subjects in the first sample, 211 in the second.

Three statistical techniques were used in analyzing the data in both samples. These techniques are (1) coefficients of correlation; (2) comparison of means and standard deviations; and (3) tests of significance. Coefficients of correlation were computed between measures of reading readiness and measures of motor coordination, and between measures of reading achievement and measures of motor coordination. The subjects in each sample were classified according to their reading achievement scores and their readiness scores as "readers" or "nonreaders" and "ready" or "unready," respectively. An average score of 1.80 on the Gates Primary Reading Tests, Form I, Types 1 and 2, was used as the criterion score to classify "readers" and "nonreaders." A score of 47 points or more was used as the criterion score to classify those "ready" and those "unready" for beginning reading. A comparison was made of means and standard deviations of the motor coordination performance of the respective paired groups. Tests of significance were computed; a one per cent level of confidence was used as the criterion of significance.

Analysis of Data. Based upon motor coordination performance, a comparison of means and standard deviations shows that "readers" and "nonreaders" are from different populations; children classified "ready" and "unready" for beginning reading are also from different populations. Five measures of motor coordination correlate significantly, but not high, with reading achievement. These measures are copying letters and numbers, copying symbols,

pegboard, tracing path, and the baseball throw for distance. Six measures of motor coordination correlate significantly, but not high, with measures of readiness for beginning reading. These measures are copying letters and numbers, copying symbols, pegboard, tracing path, balance (accuracy), and balance (speed).

Conclusions. (1) The relationship between some measures of motor coordination and measures of readiness for beginning reading is significant; (2) the relationship between some measures of motor coordination and measures of reading achievement, at the end of the first grade, is significant; but (3) these relationships are not extensive enough to warrant the use of measures of motor coordination in predicting success or failure in reading for individual pupils.

Implications. Objective evidence has been presented in this study which indicates measures of motor coordination, other than paper and pencil items (pegboard and run-bounce measures), are significantly related to measures of readiness. The establishment of this relationship implies that other measures of motor coordination are also significantly related to readiness.

121 pages. \$1.51. MicA54-1708

**AN INVESTIGATION TO DETERMINE THE
ELEMENTS OF MATHEMATICS NEEDED
TO DEVELOP THE THEORETICAL CONTENT
OF THE INTRODUCTORY COURSE IN
ENGINEERING PHYSICS AND FOURTEEN
UNDERGRADUATE COURSES IN
ELECTRICAL ENGINEERING**

(Publication No. 8410)

Richard Warren Shoemaker, Ph. D.
University of Michigan, 1954

The aim of this study is to determine the specific mathematical preparation needed by undergraduate electrical engineering students that they might understand the development of theory in the introductory course in engineering physics and in fourteen other electrical engineering courses. Excluded from consideration are the non-mathematical requisites for these courses, the mathematics needed in other engineering courses, and methods of presentation and instruction.

The criterion to be used is the presence or absence of mathematical elements in carefully selected texts suitable for use in the courses being considered.

From a selection of catalogs of colleges of engineering a search was made for electrical engineering courses most commonly offered. Fifteen such courses were selected. Next, a number of sources was consulted to compile lists of texts suitable for use in these courses. Using these lists of texts, questionnaires were drawn up, and these were sent to educators in physics and electrical engineering subjects throughout the United States. Using the answers sent in from the questionnaires and an arbitrary criterion, twenty-seven texts were selected for examination.

A page by page search was made in these texts

for the college level mathematical concepts and operations used in the expository material, on charts and graphs, and in examples and illustrations. These mathematical elements were classified according to the engineering courses in which they were used and also according to the undergraduate mathematics courses in which they ordinarily are offered.

The findings from this study indicate that: (1) mathematics is an important part of the electrical engineering program; (2) most of the elements of the traditional mathematics program are used in these engineering courses; (3) certain parts of the usual mathematics program are used only indirectly while other parts are not used at all; (4) many of the elements used in these engineering courses are not offered in the traditional mathematics sequence; (5) concepts and operations from the required elementary mathematics courses are used more frequently than are those from the more advanced required courses; (6) many mathematical elements from advanced required courses are used in the texts examined.

It was concluded that: (1) more emphasis should be placed on certain portions of the traditional mathematics sequence, as for example on complex numbers, determinants, and dimensionality in college algebra, the interpretation and use of graphs in analytic geometry, hyperbolic functions, convergence and divergence of series in differential calculus, and the solution of simple differential equations with variables separable in integral calculus; (2) certain topics, as for example the solution of oblique triangles, should be given reduced consideration; (3) a course in ordinary differential equations should be required of electrical engineering students at all schools; (4) electrical engineering students should be required or strongly urged to take a special course treating introductory and basic aspects of line integrals, partial differential equations, Fourier analysis, Bessel functions, vector analysis, statistics, the Laplace transform, and the theory of functions of a complex variable.

265 pages. \$3.31. MicA54-1709

**A STUDY OF ACCELERATION BY
EXAMINATION IN THE BASIC COLLEGE
AT MICHIGAN STATE COLLEGE**

(Publication No. 8510)

Robert Louis Sweet, Ed. D.
Michigan State College, 1954

The purpose of this study was to obtain a profile of performance of a typical group of students at Michigan State College who accelerated in Basic College courses by passing comprehensive examinations. The class graduating in June, 1953, was used as a sample. Acceleration was achieved by passing the examination after taking one or two terms of a Basic course and thus gaining credit for the entire three terms of the course. Permission to take a comprehensive examination before completing the course was based primarily on grades attained in the one or two terms which the student had taken. Accelerates are defined as those students who had received and

successfully used this permission in one or more basic courses. Certain aspects of their performance were compared to the performance of students who were eligible for permission to accelerate but did not choose to use it. The latter are defined as non-accelerates.

These accelerates and non-accelerates were compared with respect to their general academic performance in college, their grades in closely related upper-school courses, their participation in extra-curricular college activities, and their average ages at graduation. In addition, their reasons for accelerating or not accelerating were analyzed.

The 356 accelerates had significantly higher grade point averages than the 134 non-accelerates at the end of the freshman, sophomore, junior, and senior years. However, the 159 students who accelerated all possible courses had lower grade point averages at the end of these scholastic years than the non-accelerates, although not significantly so. Women accelerates had higher grade point averages than women non-accelerates and men accelerates had higher grade point averages than men non-accelerates, significant only in the senior year in each case. The 81 students transferring to Michigan State College and accelerating had grade point averages similar to those of four-year accelerates for all four years, and 35 non-accelerate transfer students had similar grade point averages to the four-year non-accelerates.

Accelerates showed a tendency (not significant) to stay in school longer than did non-accelerates, and they graduated in significantly greater numbers than did non-accelerates.

Those who accelerated two terms in a Basic College course and non-accelerates of equal ability in the same course were compared on their grades in closely related upper-school courses. The accelerates achieved slightly better grades in these upper-school courses, but not significantly so.

Accelerates participated to about the same extent in extra-curricular activities as did non-accelerates, and held offices in these activities equally as much as did non-accelerates. Those who accelerated all the courses they were eligible to accelerate also participated and held office equally with the non-accelerates.

The reason given most frequently for accelerating by 207 accelerates who returned a questionnaire was that they were desirous of getting on to upper-school courses. Other reasons frequently mentioned were a desire to ease course loads in the junior and senior years, to avoid duplication of course material learned elsewhere, dislike of the Basic College course organization and content, and to graduate in less than four years. Less than one-third of those who gave early graduation as a reason did graduate earlier, however.

Accelerates as a group were the same average age at graduation as non-accelerates.

It was concluded that students in this class took good advantage of their acceleration opportunity, that accelerates were superior to non-accelerates academically, that the very good students were accelerating frequently, but not doing all the acceleration possible, that whether a student was an accelerate or

a non-accelerate was not reflected in his participation in extra-curricular activities, that accelerating two terms in Basic College courses was no deterrent to achievement in closely related upper-school courses, and that very few students graduated early as a result of acceleration in Basic College courses.

227 pages. \$2.84. MicA54-1710

A STUDY OF EPILEPTIC CHILDREN AND A SPECIAL SCHOOL PROGRAM FOR THEIR CARE AND EDUCATION

(Publication No. 8424)

John Willis Tenny, Ed. D.
University of Michigan, 1954

The purpose of this study is to describe the development of clinical services and a special educational program for epileptic children in the Detroit Public Schools and to summarize data concerning 765 children enrolled in the program from January 1935 to June 1947.

Information was secured from official records and reports of the Detroit Board of Education, reports of the Department of Special Education, and school forms and records pertaining to the 765 children. Medical, social and intellectual characteristics and academic achievements of the children are reported in fifty-eight tables and six illustrations. Data on each child were compiled on an individual record for machine tabulation.

Chapter Two discusses the development of the program from its inception in 1934, with a survey and diagnostic clinic. The school in 1935 had twenty-two pupils. Less than 10 percent of Detroit's epileptic children have been enrolled in the school. The average duration of enrollment was two years. Most epileptic children attend regular schools and classes.

Chapter Three discusses medical services and data. The 765 children represent 25 percent of the children referred to the clinic during the period of the study. Age of onset types of epilepsy, hereditary aspects, etc., are reviewed. Seizure control or reduction was achieved in over 50 percent of the cases.

Social and personal factors are discussed in Chapter Four. Children came from all areas of the city as measured by social and economic indices. Homes were average for the neighborhood and children were well clothed and cared for according to teacher judgment. There was some evidence of emotional conflict in the homes and between children at school.

In Chapters Five and Six, intelligence of the children and their academic achievements are reviewed. Intelligence ranged from below 50 I.Q. to above 130 I.Q. with 84 the median I.Q. On retests of 284 children, the median I.Q. was 80. A relationship was found between changes in I.Q. and seizure control. Two-thirds of the children were retarded one or more grades at admittance to school and lost on the average one-half grade during their stay in school. Achievement testing supported these grade placements. With due consideration to the factors of

intelligence, it was found that epilepsy had a negative influence on academic achievement.

In the concluding chapter, it is indicated that about 10 percent of epileptic children need some special consideration in school. Medical services are prerequisite to special education. Public education is necessary to minimize the social and psychological insult to those with epilepsy. Continued research is recommended. A study of children enrolled in the school since 1947 would be meaningful. Other special programs, such as home teaching, might well be evaluated, also the education of epileptic children in regular school programs. A review of medical, psychological, and social research, with implications for the education of epileptics, is suggested.

240 pages. \$3.00. MicA54-1711

EDUCATION, ADMINISTRATION

A STUDY OF PROFESSIONAL TRAINING NEEDED BY SMALL SCHOOL SUPERINTENDENTS IN THE FIELD OF SCHOOL BUILDINGS AND MAINTENANCE

(Publication No. 8518)

Milton D. Evans, Ph. D.
University of Nebraska, 1954

Adviser: Merle Arden Stoneman

1. The Need for the Study.

Increased enrollment in the public schools, improved programs, improved holding power, extension of the school's program, changing methodology, sizeable backlogs of schoolhouse construction, have all contributed to the present school building problem.

2. The Purpose of the Study.

The future education of students who will occupy new school buildings and generations to follow will be determined, in part, by the school buildings now under construction and those yet to be built. Since the leadership of the school administrator determines, in large part, the success of the building program, this study proposed to determine the professional training needed in the area of school buildings for small school superintendents, with emphasis on specific skills and information.

3. Method of Investigation.

a. A study was made of the history of school buildings, school administration, and professional training in order to better understand the present professional training needs of school superintendents in the area of school buildings.

b. An investigation of the literature was made. From the investigation, a list of skills and information was compiled to be used as a basis for determining the essential skills in the school buildings area, particularly as distinct from desirable or unimportant.

c. The superintendents' and board members'

questionnaires were devised from the above list to determine the essential information in the area of school buildings. Both questionnaires included a personal information section, used to gain an understanding of the background and training of those included in the study.

The board members' questionnaires also measured the degree in which superintendents displayed knowledge of each skill.

d. Thirty superintendents and twelve board members from Nebraska were interviewed in order to check the clarity of the questionnaire and measure the importance of the problem.

e. The revised questionnaires were mailed to 270 superintendents and board members of small accredited schools in Nebraska. Fifty Iowa and fifty Kansas superintendents and board members of similar size schools were also included in the study.

4. Conclusions.

a. Superintendents reported that they were unprepared in the school buildings area.

b. Board members reported that superintendents should be better prepared in this area.

c. Superintendents reported that state departments should require school building courses, for administrative credentials.

d. Courses most helpful to school administrators in this area were in order: school buildings, school finance, school survey, public relations, high school curriculum planning, school law, the small school superintendent, elementary curriculum planning, internal administration, and audio-visual aids.

e. The chief reasons listed for present building were in order: extension of school program; expansion, due to more students; and replacement. Better planning in the past would have lessened the present building problems.

f. The average superintendent supervised two buildings. The range was from one to six buildings.

g. Superintendents with major school building experience more often had continuous building planning programs. A good training program would improve this condition.

h. Board members reported that superintendents were best qualified in: 1. maintenance, 2. school survey. They reported superintendents were least qualified in: 1. new buildings, 2. renovation.

i. The skills which embodied the following generalizations were considered essential: educational programming; school finance; personnel relationships; safety precautions; steps followed in various building programs; the ability to consult expert technical advice when needed.

j. Highly technical skills were considered desirable. Experts should be consulted when such problems arise.

5. Recommendations.

a. Beginning superintendents should be trained in the area of school buildings.

b. State certification requirements for administrators should include school building courses.

c. Superintendents should have teaching experience prior to being granted an administrative credential.

d. Present school building courses should include workshops, laboratory and field experiences. They should also renew emphasis in the areas of new building and renovation.

480 pages. \$6.00. MicA54-1712

THE PREDICTION OF ACADEMIC SUCCESS OF FRESHMEN AT BRADLEY UNIVERSITY

(Publication No. 8920)

Thomas Joseph Fitzgibbon, Ph. D.
Bradley University, 1954

Prediction of the success of incoming freshmen students is a perennial problem in colleges and universities. With such a problem in mind, this study at Bradley University attempted to:

1. Ascertain an empirical validity of certain tests in the freshman test battery.
2. Discover which combination of certain variables predicted first semester academic success for freshmen most accurately.
3. Determine the weights of these variables in predicting first semester academic success.
4. Determine whether better prediction for each college might result from a multiple regression equation derived from a sample peculiar to each college or from an equation derived from all samples consolidated into one large sample.

Variables in this study included the American Council on Education Psychological Examination for College Freshmen, the Cooperative Reading Comprehension Test, C2, four traits of the Johnson Temperament Analysis, the Myers-Ruch High School Progress Test, high school rank, and grade point average. The latter was the dependent variable.

Four colleges within Bradley University were represented: the College of Liberal Arts and Sciences, General; the College of Engineering; the College of Commerce; and the College of Fine Arts. These colleges furnished data for validation, construction of the regression equations, and try-out of the regression equations. The technique used for solving the multiple correlations and for furnishing data for the regression equations was the Wherry-Doolittle Test Selection Method.

Empirical validities of the variables involved in this study varied from college to college, as did their rank order within a college. The most stable was the high school rank which evidenced the largest validity coefficient in all samples in which it was derived. There were several negative coefficients with the criterion and, in all instances, these concerned traits within the Johnson Temperament Analysis.

Multiple correlation coefficients calculated by the Wherry-Doolittle method ranged from .630 for the Commerce College sample to .735 for the Engineering College sample. The groups of independent variables selected by the Wherry-Doolittle changed in make-up from college to college. High school rank was the first selected variable in all selections and made the greatest contribution to criterion variance in all instances. All tests were represented at some

time or another in the batteries selected for the different samples, with the ACE present only once. Two traits of the Johnson Temperament Analysis, however, were selected a total of six times.

Predictions made by specific regression equations derived for each college proved not to differ significantly from predictions made for each college by the equation derived from all the samples consolidated into one large sample. Only in the College of Engineering did the predictions made by a specific equation correlate as highly with actual grade point average as did those made by the equation derived from the consolidated sample - the combined equation. These differences, however, did not approach closely the .01 level of confidence set as the significant level for this study.

It would seem, that if regression equations are to be used in the prediction of academic success of freshmen at Bradley University, as good predictions could be made in the four colleges through use of the combined sample equation. Certain dangers regarding reliance on face validity of a test seem to be evident in this study also. The "L" score on the ACE, for example, might easily be chosen by a test interpreter as a variable that would enhance prediction in a college whose course content is highly verbal in nature, as perhaps in Liberal Arts and Sciences, General. Such is not the case in this study, however, for the "L" score was not selected by the Wherry-Doolittle for any test battery.

Recommendations were made which concerned:

1. The desirability of further use of these equations so that their predictive power could be studied over a longer period of time.
2. A duplication of the study using larger samples and high school rank grouped according to certain selected high school sizes.
3. The need for constructing expectancy tables in order to make the results more helpful to counselors.
4. The need for studies of this type to take more cognizance of motivational factors.
5. The communication of the results of this study to Bradley University freshmen counselors so that they might become more aware of the predictive qualities of the variables involved.

139 pages. \$1.74. MicA54-1713

THE ACADEMIC DEAN IN AMERICAN TEACHERS COLLEGES

(Publication No. 8454)

Leonard Clarence Haas, Ph. D.
University of Minnesota, 1954

This study examined the academic deanship in teachers colleges, with the purpose of discovering the chief characteristics of this position, the qualifications of those currently occupying it, and the actual functions these persons were performing. Attention was also given to functions that academic deans thought should be associated with this office. Although several studies of similar nature had been made in liberal arts colleges, the only comparable

study in teacher education institutions dated back to 1926 and involved only twenty-six colleges.

To obtain data for the study, an eight page questionnaire, consisting of 114 items, was sent to the 182 member colleges of the American Association of Teachers Colleges in 1947. Responses were received from 170 colleges, some of which had not yet established this office. The 115 institutions finally included constituted 91 per cent of those teachers colleges which had academic deans. Responding colleges were located in forty different states and the District of Columbia. In analyzing these replies, the colleges were grouped according to size to determine whether the dean's functions varied significantly on this basis.

Office of the academic dean. — The typical teachers college included in this study had established the office of academic dean in 1932. The office was apparently well established in the North Central, Middle Atlantic, and Southern States. Holding the rank of a professor, the typical academic dean taught four hours a week or less, and was kept busy with administrative duties throughout the calendar year. Financially, he fared considerably better than his classroom colleagues. He normally attended three national or regional meetings annually.

Personal qualifications and preparation. — The typical academic dean was a middle-aged man holding an earned doctorate. His graduate major was in professional education and his undergraduate major in social science or English. Prior to becoming dean, he had considerable teaching and administrative experience, often in elementary as well as secondary education. Usually appointed from the faculty of his present college, he had been a staff member for fifteen years and academic dean for five years. He had written for publication and held memberships in four professional organizations.

Functions of the dean. — Directly responsible to the president, he usually advises the president on academic problems and acts for him in his absence.

He takes an active role in the recruitment and promotion of faculty members and is responsible for assigning classes and distributing faculty loads. He not only encourages research on the part of his faculty but personally conducts curriculum and student personnel studies. Typically, he serves on six faculty committees, acting as chairman of two of them.

One of his major responsibilities is to improve instruction. To accomplish this, he confers with individual faculty members, conducts group conferences on teaching problems, visits classes, and organizes an in-service training program. Deans in large colleges have greater opportunity to engage in these functions.

In his capacity as chairman of the curriculum committee, the dean assumes leadership in developing and revising the curriculum. He also typically edits the college catalog and summer session bulletins.

In all colleges, but to a greater degree in the small ones, the academic dean has a prominent role in the student personnel program. Characteristically, he confers with students, coordinates registration procedures, exercises final authority on all

academic matters involving students, administers graduation requirements, and effects some general coordination of student personnel services.

Regardless of the college size, the dean typically indicated he would like to assume a larger role in curriculum and instruction matters.

This study underscores the need for making the dean's chief responsibility that of giving leadership to the staff in developing the instructional program.

222 pages. \$2.78. MicA54-1714

A COMPARATIVE STUDY OF FACTORS RELATED TO RETENTION AND WITHDRAWAL OF FRESHMAN STUDENTS AT THE UNIVERSITY OF ARKANSAS

(Publication No. 8372)

Charles Jerold Hanks, Ed. D.
University of Arkansas, 1954

Major Professor: Roy B. Allen

The purposes of the study were to analyze the nature, extent, and reasons for freshman withdrawals at the University of Arkansas and to determine whether there are significant differences between those freshmen who withdrew and those who remain in school.

Included in the study were all full-time freshman students enrolled in the undergraduate colleges of the University of Arkansas for the academic years 1950-1951, 1951-1952, and 1952-1953, who had not previously enrolled at another institution of higher learning.

Findings. Of the 1,902 freshman students included in this study, 595 failed to enroll for their second year of study. This represents a gross mortality of 31.3 per cent. The mortality in the various colleges of the University was fairly uniform and independent of year enrolled.

The reasons given most frequently for withdrawal were transferred to another school, entered military service, had financial difficulties, to enter employment, married, deficiencies in scholarship, lack of interest, personal and family difficulties, and wrong vocational objectives.

The records at the University show that most persons who withdraw do so voluntarily. Only seventy-five, or 12.6 per cent of the withdrawals, had been asked to leave. However, for the 551 withdrawals for whom grades were available, the mean cumulative grade-point average was 1.17 and 69.2 per cent had an average of less than 2.00.

With few exceptions the withdrawal group indicated that they were either gainfully employed or back in school. Approximately 69 per cent of drop-outs indicated that they either had returned to college or planned to do so in the future.

The results of this study indicate that freshman withdrawals, compared with those who remain in school, have:

1. Less scholastic aptitude as measured by the ACE Psychological Examination.

2. Less mastery of the English language as measured by the Cooperative English Test.
3. Lower high-school cumulative grade-point averages.

Additionally, the group of withdrawals, compared with those students who remain in school, had significantly large percentages of students who were:

1. From homes in the immediate vicinity of the University or from outside the state.
2. Married.
3. More satisfied with the freshman orientation program.
4. Less satisfied with the program offered at the University of Arkansas, as evidenced by their willingness to recommend the University to graduating high school seniors.

The two groups did not differ significantly with respect to fifteen other factors considered.

Recommendations. On the basis of the findings of this study certain recommendations are made. (1) The fact that one of the reasons most frequently given for withdrawal is lack of finances suggests that the administrative staff should evaluate its scholarship program, provide an adequate staff to assist students in obtaining part-time employment, and take steps to provide all students with information concerning financial aid available to them. (2) The orientation program should be examined in light of the criticisms made by both the dropouts and non-dropouts. (3) The University should perhaps examine its student-activity program to determine why so few of the entering freshmen participate in student activities. (4) The need for developing a careful plan of exit interviewing is suggested by this study. (5) The administrative staff should investigate the advisor and registration system, as it now operates, in view of the dissatisfaction expressed by students in this study. (6) Special study should be given to developing a more adequate guidance program for all students as well as coordinating the services now available. (7) The study of retention and withdrawal of students at the University of Arkansas should be continuous and increased in scope, with the view of decreasing the number of withdrawals.

192 pages. \$2.40. MicA54-1715

A STUDY AND ANALYSIS OF THE INDEBTEDNESS OF THE PUBLIC SCHOOLS OF ARKANSAS

(Publication No. 8373)

James Dwight Hobbs, Ed. D.
University of Arkansas, 1954

Major Professor: Paul V. Petty

Statement of the Problem

The purpose of this study was to examine and analyze the records of the indebtedness of the public schools of Arkansas in an attempt to answer these questions:

1. How does the public school indebtedness of

Arkansas compare with the public school indebtedness in certain selected states comparable to Arkansas in their abilities to support education?

2. Is the amount of the public school indebtedness in Arkansas significantly influencing the quality of the school program in the public schools of Arkansas?

Procedures Used

The states were selected as comparable to Arkansas in ability to support public school education on the basis of their ranking in the nation in accordance with adjusted personal income per weighted classroom unit. The three states immediately above Arkansas and the three states immediately below in the national ranking were selected as comparable to Arkansas in ability to support education.

To determine whether or not there was a relationship between the public school indebtedness in Arkansas and the quality of the public school program being offered, each of six selected criteria which had been validated in other studies was correlated with the indebtedness per average daily attendance in each of the 423 public school districts in Arkansas.

Findings and Conclusions

Considering the ability of each state to support education, the public school indebtedness of Arkansas was found to be five and eight-tenths times that of West Virginia, three and five-tenths times that of North Dakota, one and seven-tenths times that of North Carolina, two and three-tenths times that of South Carolina, four times that of Alabama, and one and one-half times that of Mississippi.

Each of the six selected criteria had a positive correlation with the indebtedness of the schools. Five of the correlations were significant at the one per cent level of confidence while the other one was not significant.

The conclusions which the findings of the study support were as follows:

1. The public school indebtedness of Arkansas is higher than the public school indebtedness of other states comparable to Arkansas in ability to support public education.
2. The indebtedness of the public school districts of Arkansas has a positive significant relationship with the quality of the educational program being offered in the public schools of Arkansas. The school districts with the highest indebtedness, in general, provide greater current expenditures, pay higher teachers' salaries, employ better prepared teachers, retain them longer, and have higher rated high schools.
3. There was no evidence that the indebtedness of the public schools of Arkansas had reached a danger point.

Recommendations

1. It is recommended that the school districts in Arkansas be required by law to file records of

post-dated warrants with the State Department of Education so that the State Board of Education can effectively invoke the provisions of the school indebtedness limitation law.

2. It is recommended that school administrators encourage local boards of education in Arkansas to provide adequate clerical help in the schools. Only about half of the school districts reported expenditures for this purpose in 1952-53. The expenditure category in the budget might be more clearly defined to assure complete reporting of these expenditures as some schools were known to have had such expenditures that were reported with other items.

3. It is recommended that some study be devoted to determining a better method of financing school construction than the issuing of school district bonds for the entire cost. The trend in other states is toward dividing the financial responsibility for construction between the state and the school district.

4. It is recommended that some basis of limiting school district indebtedness, other than a per cent of the assessed valuation of the property in the district, be considered for Arkansas. A limitation based on the yearly budget, including state aids, might be a step in the right direction.

194 pages. \$2.43. MicA54-1716

THE IN-SERVICE EDUCATION OF PUBLIC SCHOOL ADMINISTRATORS

(Publication No. 8524)

Norman LeRoy Krong, Ph. D.
University of Nebraska, 1954

Adviser: Merle Arden Stoneman

The purpose of this study was to review the practices of the University of Nebraska and five additional teacher-education institutions in other states as they relate to the in-service education of public school administrators. It included a survey of the literature relating to the in-service education of public school and other public administrators. It proposed eight criteria which were used as a basis for the review of the in-service education programs of the selected institutions. It also sought to determine the amount and kind of in-service education available to the public school administrators of Nebraska from the University of Nebraska and other sources.

The first phase of the investigation of the practices of the selected institutions was that of visiting the institutions and interviewing the appropriate authorities. The second phase was that of securing the opinions of the administrators and board members of selected school districts through the use of the questionnaire method. Questionnaires of the check-list type were mailed to 1062 administrators and board members in areas near the selected institutions. Questionnaires made up of a series of open-end questions were sent to a comparable group of 1074 administrators and board members.

The amount and kind of in-service education available to the public school administrators of

Nebraska was determined through questionnaires sent to selected administrators and through interviews with the authorities of the University of Nebraska, the Nebraska State Department of Public Instruction, and the Nebraska State Education Association. The following statements summarize the findings of this study:

1. All of the selected institutions reported that adequate physical facilities are generally available both on and off the campus.

2. They denoted that their finances are, for the most part, adequate for the present program, but that additional funds are needed for greater emphasis in certain fields.

3. The final responsibility for the in-service program rests with the dean of the college or with the chairman of the department of educational administration. The immediate responsibility for the individual services is usually placed upon an extension division, a bureau of school services, or a similar administrative division or upon one of the staff. The members of the university faculty share in the planning of the program, but little effort is made to involve other professional or lay groups in the planning.

4. The universities seek as staff members those persons who have the doctorate and public school experience. Practicing administrators are included on the summer session's staff.

5. The universities emphasize classes, educational surveys, group conferences, and consultative services in their approach to in-service education. They emphasize less the internships, workshops, and study councils. Classes and workshops provided on campus are recognized as a part of the teaching load. The other services are sometimes given little recognition in the assignment of teaching load.

6. It was reported that participation is prompted by incentives which seem professionally desirable. The principal obstacles to participation are distance and lack of time.

7. Group conferences, classes, consultative services, and workshops are reported to be the most valuable of the services.

8. The questionnaire returns indicate that the services are more readily available on campus than off campus. The administrators participate more in the on-campus services and find them more valuable.

9. The needed changes listed most frequently in the returns were these: more emphasis on practicality; greater use of the problems approach; and the provision of more services in the field.

10. The Nebraska administrators signified that the University of Nebraska and the State Department of Public Instruction assume the major responsibility for the in-service program provided to them.

365 pages. \$4.56. MicA54-1717

EDUCATION, ADULT

ADULT EDUCATION IN THE
DEMOCRATIC STATE OF TURKEY

(Publication No. 8797)

Banu Şavli, Ph. D.
Indiana University, 1954

Chairman: William H. Fox

Statement of the Problem

The purpose of this study was an attempt to show the ideal form of adult education for a people living in a democracy. The major emphasis is placed on what a new democratic nation like Turkey has done and could do to give each individual the opportunity of equal education and creativeness whereby a healthy, democratic, common culture could be sustained for all the nation.

Sources of Material

Part of the data presented in this study were obtained from a comprehensive search of both English and Turkish literature applicable to the problem at hand. The remainder of the data were obtained by means of inquiries sent to a number of agencies and individuals, both in Turkey and America.

Findings

A survey of the Turkish scene indicates that since Turkey became a republic in 1923, education has been the guiding spirit of the whole democratic social reform movement. The belief was that only through education individuals enjoy fully the freedoms and privileges of a civilized society. To serve the purpose of equipping adults with the tools necessary for social adjustment, adult education as an organized movement in Turkey started with the republic.

As the scope of the current adult activities on a national level indicates, this movement (which is mostly controlled by official organizations and which greatly emphasizes literacy, agriculture, vocational, and technical education), is not as progressive as it should be. The aim was to develop throughout the nation individuals of intelligence and character who could face successfully and effectively the responsibilities of democratic living. Findings show that although the education and knowledge have been increased, this has not been done evenly throughout its total range. Ideals, in certain cases, have affected the appearance but not the mentality. In spite of the measures taken, the rate of illiteracy is still high, amounting to 65 per cent. Especially in the 40,000 villages scattered around the nation, illiteracy constitutes the major problem for the vast majority of the farming population in the struggle for higher standards of living. Among the reasons for these inadequacies are the lack of: (1) finances, (2) organization, planning and coordination among the agencies active in the field, (3) voluntary organization,

(4) efficient applied methods and techniques, and (5) competent leaders.

Conclusions and Recommendations

Analysis of the political, economic, social, and educational aspects of democracy existing in Turkey reveals that there are certain weaknesses that need strengthening. The reforms and democratic ideals have affected the appearance but not the mentality of the people. This study believes that programs for adults, if carefully planned, could be used as a remedy for the weak links existing within the Turkish democracy. On the assumption that the principle wealth of a nation is founded in its people, if we want the Turkish democracy to take deep roots and flourish, two steps need to be taken.

1. The productivity of the existing adult education movement should be improved.

2. Ways and means should be designed whereby the rural population can be stimulated into taking an active part in raising their own educational and social standards, and thus contribute to the building of a common culture for all the nation.

258 pages. \$3.23. MicA54-1718

EDUCATION, HISTORY

THE ATTITUDES OF THREE PATRIOTIC
SOCIETIES TOWARD EDUCATION IN
MICHIGAN, 1870 TO 1950

(Publication No. 8428)

Paul Unger, Ph. D.
University of Michigan, 1954

The purpose of this study is to analyze factors which motivated the Michigan divisions of the Grand Army of the Republic, of the Daughters of the American Revolution, and of the American Legion to initiate and to encourage activities in public schools. An examination has been made of the publications, periodicals, and proceedings of the three patriotic societies to find reasons for the interests of the patriotic societies in the observance of holidays, in citizenship education, in attempts to prevent subversive activities, and in legislative proposals in relation to schools. Because officials of the Michigan Department of the American Legion made stipulations on the use of their records that would have limited this research, newspapers, published by posts of the American Legion, which contained official records of the American Legion and interviews with some of the leaders of the American Legion were used in the study. Positive and negative criticisms of the educational activities of the three patriotic societies as they have been reported in the press and in the publications of other interest groups also have been examined for statements of purpose other than those given by the societies.

The Michigan patriotic societies established programs with objectives and procedures that were

similar in design. The school observance of holidays seems to have been urged by patriotic societies partly for the purpose of perpetuating recognition for the services of members of the armed forces in past conflicts. Citizenship education projects were advocated by patriotic societies chiefly to teach respect for authority. To promote resistance to certain changes in social, economic, and political matters, the societies have attempted to proscribe the activities of allegedly subversive groups. In proposals for the enactment of legislation affecting education, the societies have been moved by all these considerations. While the three patriotic societies carried out similar activities and held similar interests, the Legion also worked for the interest of the veteran in the hope that the veteran would become a member of the Legion. The desire of the Legion to increase its membership was, perhaps, a factor that explains the strong influence of the Legion.

In the examination of the activities of the three chief patriotic societies of Michigan, it was found that the societies gave as their reasons for attempts to influence public education the wish to promote general respect for the participants in military conflicts of the past and for the ideals of the organizations which represent military heroes. The preservation of a cultural heritage which recognized the military contributions of certain citizens, it is concluded, is a reason indispensable to an examination of the causes for the activities of patriotic societies in the public schools of Michigan, 1870 to 1950.

191 pages. \$2.39. MicA54-1719

EDUCATION, PSYCHOLOGY

A COMPARATIVE STUDY OF CERTAIN ASPECTS OF THE SOCIAL ADJUSTMENT OF FARM AND NONFARM PUPILS IN SELECTED MINNESOTA HIGH SCHOOLS

(Publication No. 8443)

Richmond Grenfell Banks, Ph. D.
University of Minnesota, 1954

Farm and nonfarm ninth grade pupils in five of the six village high schools in one Minnesota county were compared in social acceptance, personality adjustment, and socioeconomic status. The extent to which farm pupils accept nonfarm pupils and nonfarm pupils accept farm pupils was determined. A measure was obtained of the awareness which farm and nonfarm pupils possessed concerning their social acceptance status. The relationship between social acceptance status of the subjects in various school situations was determined.

Social acceptance was defined as the quality associated with those pupils who are chosen by their classmates as desirable associates in certain hypothetical school situations. These situations were (a) a school party, (b) an assembly-planning committee, (c) a classroom committee, (d) eating lunch,

(e) a physical education team, and (f) a gang. A sociometric test, devised to measure social acceptance status, required students to choose the classmates they would like to have as associates in these situations. Pupils were allowed to choose as many classmates as they wished for each situation. The number of choices a subject received from his classmates in a given situation was considered a measure of his social acceptance status in the group. Test-retest coefficients of reliability ranged from .89 to .95 for the six parts of the sociometric test. A thirty-day interval separated test and retest. Validity of the test was supported by evidence that elected representatives and pupils considered most popular consistently scored higher on the scale than did other students.

Other inventories used in the study were the Sims Score Card for Socio-Economic Status, the Bell Adjustment Inventory, and a questionnaire formulated by the writer. Basic data for the study were obtained from 201 of the 220 pupils enrolled in the ninth grade classes of the five schools. The representativeness of the obtained samples of pupils in schools where pupils were absent on the testing date was checked by means of the chi-square test. Samples were found to be representative of the total group with respect to sex and farm-nonfarm classification.

Analysis of variance, the t-test, the Behrens-Fisher test, and correlation were the chief statistical tools used in the study. Results of the statistical analyses gave support to the following conclusions:

1. No significant differences existed in the responses of farm and nonfarm youth to the four parts of the Bell Adjustment Inventory (Home Adjustment, Health Adjustment, Social Adjustment, and Emotional Adjustment.)

2. No significant differences between farm and nonfarm pupils existed in socioeconomic status as measured by the Sims Score Card for Socio-Economic Status.

3. Nonfarm pupils enjoyed a more favorable social acceptance status in all of the school situations than did the farm pupils.

4. Farm pupils, as well as nonfarm pupils, demonstrated a preference for nonfarm pupils as desirable associates in all of the school situations studied.

5. Neither farm nor nonfarm youth appeared to be aware of their social acceptance status with their peers. They seemed to have best insight into their status in the physical education team situation, but even in that instance the awareness was at a very low level.

6. Social acceptance appeared to be a generalized characteristic which applied in all of the school situations studied. The individual well-accepted in one type of school situation tended to be well-accepted in other similar or dissimilar situations.

The findings of this study emphasize the need for educators in school systems enrolling both farm and nonfarm pupils to study the social adjustment problems of their students. Where necessary, practical steps should be taken to enable farm youth to adjust more readily to the high school environment.

264 pages. \$3.30. MicA54-1720

A STUDY OF THE GROUP SCALES OF THE STRONG VOCATIONAL INTEREST BLANK AS PREDICTORS OF ACADEMIC ACHIEVEMENT AND OF THE RELATIONSHIP OF THE GROUP SCALES TO PRIMARY INTEREST PATTERNS

(Publication 8636)

Alva Critchley Cooper, Ph. D.
Columbia University, 1954

The first part of the study investigated the efficacy of the Strong Group Scales as predictive instruments in the determination of drop-out rate, number of changes of major, and grade point average within a college population.

The data were gathered at Syracuse University through the facilities of the Psychological Research Services and the Office of the Registrar. The subjects were 867 male undergraduates selected from a total of 1286 who had answered the Strong Vocational Interest Inventory upon entrance in 1949.

Four hypotheses were formulated for investigation:

Hypothesis I. The proportion of drop-outs is greater among students who obtain no group scale scores of A than among those who obtain at least one group scale score of A.

Hypothesis II. Students with no group scale score of A make more changes of major than do those who obtain at least one group scale score of A.

Hypothesis III. Students with no group scale score of A obtain lower grade point averages than do those who obtain at least one group scale score of A.

Hypothesis IV. Students who enter a curriculum consonant with the interest group in which they score A obtain higher grade point averages than do those who enter a curriculum not consonant with the interest group in which they score A.

Chi square was used to test the significance of the findings for both Hypothesis I and II. In each case, results were not significant at the .05 level and neither hypothesis was established.

In testing Hypotheses III and IV, dealing with grade point averages, the results of the ACE were used in t tests to determine possible differences in intelligence level between the comparison groups. For Hypothesis III, no difference in intelligence was found between the A Group and the No-A Group. For Hypothesis IV, the group with consonant majors was found to have the higher ACE mean. However, no significant difference in grade point averages was established between (a) the A Group and the No-A Group and (b) the groups with consonant and non-consonant majors.

The results of this study did not indicate that high scores on the group scales predict whether students will complete a college course, achieve stability within college curricula, or achieve high grades.

The second part of the study dealt with the relationship of group scales to primary interest patterns. Group scales represent clusters of the individual occupations, and therefore, should make it possible to highlight a student's interests within a broad area of occupations. In contrast, primary interest patterns,

derived directly from individual occupational scales, provide an exact delineation of a broad area of occupations. Therefore, it would help in the interpretation of group scales if it could be demonstrated that a high score on a group scale indicated a primary interest pattern within the particular occupational cluster.

Four hundred and fifty inventories were re-scored to obtain individual scales within group scale areas. The data showed that a score less than A on a group scale indicated the absence of a primary interest pattern, but that a score of A was not equally conclusive as to the presence of a primary interest pattern since the percentage of primary interest patterns was high only in the case of Group IX. In the population studied, scores less than A on the total inventory were obtained by only 14.5 per cent of the students. The findings, therefore, raise a question as to the usefulness of the group scales in counseling students when it is advisable to consider broad areas of occupations.

63 pages. \$1.00. MicA54-1721

THE EFFECTS OF VARYING AMOUNTS AND KINDS OF INFORMATION AS GUIDANCE IN PROBLEM-SOLVING

(Publication No. 8638)

Bernard R. Corman, Ph. D.
Columbia University, 1954

An unresolved issue in educational practice is the desirability of making available greater rather than lesser amounts of information as guidance in problem-solving. Information may be of two kinds; it may relate either to the principle or to method. It was hypothesized that performance would improve as the amount of information given as guidance about method of solution or principle for solution was increased.

Several forms of the "match-task" were presented to twelfth grade students. In guidance there were three variations in the amount of verbal information given about the principle: "No information"; "Some information," a clue to the principle; and "Much information," a statement of the principle. Similarly, students were given "No," "Some," and "Much" information about the method of solving examples. The combination of the amounts of information about method and principle yielded nine different instruction treatments ranging from one with no information about either the principle or the method, to one with highly directive information about both principle and method. Success was appraised in the number of instructional tasks solved, in transfer to simple and complex problems, and in verbalizing the principle separately for students above and below average in mental ability.

For above average in mental ability students, success in solving problems increased only for the instruction problems directly as the amount of information given about method increased. For students of lower ability, some appropriate guidance was superior to no guidance. In solving the problems both for

students above and below average in mental ability, information about the rule did not seem to affect results differentially.

For the simple transfer problems, the more capable students seemed to profit most from the combination of explicit information about the rule with an indirect clue to the method, or from a clue to the rule in combination with explicit information about method. On the complex transfer tasks, the high ability students receiving only information about the method, or only an indirect clue to the rule, did less well than students given other combinations of information. But on these complex tasks, students of less than average ability given only guidance to the method, in either the direct or less explicit form, were superior.

No treatment effects remained for the complex transfer problems once an adjustment had been made for differences on the simple transfer tasks. Similarly, for the high ability group, at least, no treatment effects remained on the simple transfer problems once scores were adjusted for differences in success on the instruction problems.

Success in writing the rule increased as the amount of information students had been given about the rule increased, although only the students given the most explicit information about the rule were superior to those given no information about the rule. In writing the rule, no effects were noticed which could be attributed to the amount of information the students had received about the method of solving examples. Success in verbalizing the rule was uncorrelated with success in solving the problems.

These results were interpreted to indicate (a) that information used in guidance must be appropriate to the task set for the student, (b) that some appropriate guidance is beneficial, but that failure to provide it will delay rather than prevent solution, (c) that the effectiveness of guidance does not depend solely on the amount of information imparted, but that (d) more explicit instruction will prove most helpful with the more able students while (e) less explicit instruction may be just as effective as more directive guidance for the less able students.

117 pages. \$1.46. MicA54-1722

**AN ANALYSIS OF FACTORS AND CRITERIA
RELATED TO THE ADMISSION OF
BORDERLINE CASES AT MICHIGAN STATE
COLLEGE, FALL QUARTER 1952**

(Publication No. 8499)

Gail Frederic Farwell, Ed. D.
Michigan State College, 1954

This study is an investigation of the characteristics of borderline admissionees and their subsequent academic success during the first year of college enrollment at M.S.C. Each year a considerable number of applicants are admitted to Michigan State College on the basis of a program of individual testing and counseling rather than by the criteria regularly used. Specific purposes included the investigation of: 1) group similarities and differences that exist

for borderline admissionees, regular admissionees and those refused admission with respect to personal, family and home, and secondary school background; 2) the relationship between common orientation test factors, high school rank and the recommendation of high school officials, and the cumulative grade-point-average in college for the borderline and regular admissionees; 3) the relationship between recommendations made by the Michigan State College counselors and the cumulative GPAs for the borderline admissionees.

Three groups of two-hundred and twenty-eight applicants each were utilized. They were as follows: 1) borderline admissionees - those applicants admitted on the basis of an individual testing and counseling program; 2) regular admissionees - those applicants admitted on the basis of the usual criteria of high school record and recommendation; and 3) the refusals - those applicants not granted admission to Michigan State College.

Correlations were computed for the borderline and regular admissionees to ascertain the relationship between selected criteria and the respective cumulative grade-point-averages for the three terms of the freshman year. Percentage tables were assembled showing the frequency of each application factor for each of the three samples. An analysis was made and a report rendered of the similarities and differences.

The major findings emphasized the group similarities with respect to application blank information with the exception of high school academic achievement. At the same time, a wide range of differences was found for individual applicants in all three groups. The obtained correlations between derived scores of the orientation tests and the cumulative GPAs for the regular sample ranged between .45 and .50. These are similar to those found by other investigators. However, an increasing relationship was found with cumulative GPAs for successive school terms. High school rank and cumulative GPAs in college revealed similar average r 's. Correlations of .20 to .30 were obtained for the borderline sample when considering the same factors.

Correlations between high school recommendations and cumulative GPAs for both samples ranged between .12 and .26. When percentage tables were established, as to predictability of the applicant meeting the minimum passing standard of 2.00, the value of the recommendations was somewhat more favorable. The M.S.C. counselor recommendations for the borderline admissionees correlated .33 with the first term GPA, and .58 with the 2nd and 3rd term cumulative GPAs. This would appear to justify a continuation of this program of admissions for this type of applicant.

The high school recommendations were incomplete or cursory in more than seventy percent of the applications. When both secondary school and college officials believe recommendations are of real importance, a more serious approach and a more complete exchange of information appears to be dictated.

211 pages. \$2.64. MicA54-1723

THE DEVELOPMENT OF A TECHNIQUE FOR
THE PREDICTION OF PUPIL ACCEPTABILITY
TO HIGH SCHOOL TEACHERS

(Publication No. 8532)

Carl J. Gulde, Ed. D.
University of Houston, 1954

The purpose of this study was the development of a technique for predicting pupil acceptability to high school teachers. It was proposed to develop, standardize, and validate a temperament type test to be used as one predictor of acceptability and to combine this predictor with an intelligence test for more effective prediction.

It was suggested that the use of these predictors, at the time of pupil enrollment in high school, would enable the counselor or principal to help the least acceptable pupils make a better adjustment to high school. Such a technique would also be of assistance to the headmaster or principal of a private high school or academy in the selection of pupils for enrollment.

This temperament type test, called An Index of Feeling, was constructed on the hypothesis that high school pupils feel the extent to which they are accepted by others and will indicate the degree to which they feel accepted by their answers on a temperament type test, if this test is made up of items having meanings of acceptance and rejection.

After the test had been constructed it was administered to the student body of Spring Branch High School, Spring Branch, Texas. This school had grades nine, ten, eleven, and twelve enrolled at the time the test was administered, with an enrollment of approximately four hundred seventy-five pupils. A total of four hundred and four valid answer sheets were obtained. At the time the test was administered to the student body, the teachers in the school were asked to indicate the two most acceptable and the two least acceptable pupils in each of their classes. This was the criterion used for the standardization of the test. A cross validation procedure was used in the selection of the items.

Grades ten, eleven, and twelve at Spring Branch had, in their folders, profile sheets for the Science Research Associates, Primary Mental Abilities Test. The I.Q.'s of these students were correlated with the acceptability ratings used for the standardization of An Index of Feeling. The correlation between the two tests was calculated. A multiple R was calculated and a regression equation written to use the two tests in combination as predictors.

Two validation studies were made. One study was done with court wards. An Index of Feeling was administered to this group. The median score of the court wards was much lower than that of the Spring Branch group, the difference being significant at the .01 level of confidence.

The other validation study was done at Kinkaid High School, a private school in Houston, Texas. The freshman class, with an enrollment of fifty-four pupils, was used for the study. Both the SRA, PMA and An Index of Feeling were administered to this group and teachers rated the class for acceptability.

Effectiveness of prediction for An Index of Feeling was greatest at the most acceptable end of the distribution. In this freshman class, approximately one-fourth of the pupils were rated in the most acceptable group by a majority of the freshman teachers. This is a ratio of one acceptable to three non-acceptable. By using a critical score which would eliminate the lower seventy percent of the class the ratio would be changed to three acceptable to one non-acceptable.

By combining the two tests as predictors with the Spring Branch regression equation and using a critical score to divide the distribution, good prediction occurs. The upper fifty-nine percent of this division contains eighty percent more acceptable and twenty percent less acceptable. The lower forty-one percent of the division contains twenty-four percent more acceptable and seventy-six percent less acceptable.

95 pages. \$1.19. MicA54-1724

CLASSIFICATION BY MULTIVARIATE
ANALYSIS WITH OBJECTIVES OF
MINIMIZING RISK, MINIMIZING MAXIMUM
RISK, AND MINIMIZING PROBABILITY
OF MISCLASSIFICATION

(Publication No. 8458)

Murray Clemens Johnson, Ph. D.
University of Minnesota, 1954

Major Adviser: Palmer O. Johnson

In problems of classification arising in education and psychology, it may be found that the consequences of wrong decisions are not equally undesirable. Somewhat unique in this investigation was the assumption that it was possible to specify the loss of utility resulting from a wrong decision.

Principles for choosing a rule of classification were based on losses incurred with misclassifications. By the risk of committing an error in classification was meant the probability of that error multiplied by the corresponding loss. The criterion by which a rule was chosen varied with the presence or absence of a priori probabilities of drawing an individual from the populations. If probabilities were assumed to be known, a rule was selected which minimized risk of misclassification. If it was not possible or appropriate to assign a priori probabilities, a rule was chosen which minimized maximum risk of misclassification.

This investigation had its setting in the General College of the University of Minnesota, and dealt with the classification of students into educational groups on the basis of measures commonly used for counseling purposes. The groups were assumed to represent normal multivariate populations with the same set of variances and covariances. Comparable samples were obtained on which to establish classification criteria and cross validate results. This was done by selecting a random half of all students matriculating in the General College during the fall quarters of 1949 and 1950.

A major problem was that of establishing a rule for classifying a student into one of two groups: a) students who were accepted for transfer by another college of the University and did not graduate from the General College, and b) students who graduated from the General College. Estimates of the comparative seriousness of the two possible errors of classification were obtained from experienced counselors in the General College. Similar classification rules were established using two different sets of variables. The duplication was made to examine the model under different conditions of application, and to attempt a more efficient separation of the groups. For each set of variables, three solutions were obtained corresponding to the following standards of goodness: minimizing risk of misclassification, minimizing maximum risk of misclassification, and minimizing probability of misclassification.

All classification rules were employed to classify a new sample of students, and performance of a rule was compared with results predicted by the underlying model. Generally speaking, the models appeared to be functioning according to their formal mathematical solutions as evidenced by actual and predicted probabilities of misclassification. Since greater disutility was attached to misclassification of transfers, the solution of minimum risk assigned the majority of students into the transfer category.

Another major problem was that of establishing criteria for classifying a student into one of three groups of General College students. Insofar as number and type of individuals, this problem differed from the two-group application only by the addition of a third category, students who dropped out of General College before graduation. However, the additional category effected changes in procedures by which the problem was solved. These changes included an assumption of equal costs of misclassification, and the use of the bivariate normal table in obtaining the minimax solution.

In all applications, detailed discussion was given to performance of the models, together with some implications for counselors. Satisfactory determination of utility values was suggested as the greatest obstacle to research of this type. Associated literature was reviewed.

181 pages. \$2.26. MicA54-1725

THE PREDICTIVE VALUE OF ENTRANCE READING TEST SCORES AT THE UNIVERSITY OF WASHINGTON

(Publication No. 8359)

James Jackson Rutherford Munro, Ed. D.
University of Washington, 1954

The main purpose of this study was to determine the comparative predictive value of the unanalytical and timed Reading Comprehension (Test C₂) of the Cooperative English Test (Higher Level - Form S) and the analytical and untimed Dvorak-Van Wagenen Diagnostic Examination of Silent Reading Abilities. The study was made on the entrance data and the

first three quarter freshman university data of 1914 freshmen who entered the University of Washington in September 1950.

A time-saving and efficient iterative technique of multiple correlation, developed by Dr. Paul Horst, Professor of Psychology at the University of Washington, was employed in this study to obtain multiple R's and beta weights.

The three reading variables, speed, vocabulary, and comprehension taken from each of the two selected reading tests were included separately with those of high school average, A.C.E.(Q) and A.C.E.(L) to form two six variable predictor batteries. The comparative predictive efficiency of these batteries was determined for sixteen university criterion areas in terms of multiple R's. In general, the predictive efficiencies of the two batteries, and consequently of the two reading tests, were found to be practically equal.

The sixteen multiple R's obtained with the six variable battery which included the three Cooperative Reading Test variables ranged from .3800 to .6531, with an average index of forecasting efficiency (E) of .1669. The multiple R's obtained with the six variable battery which included the three Diagnostic Reading Test variables ranged from .4053 to .6547, with an average E of .1704.

As additional variables to high school average, A.C.E.(Q) and A.C.E.(L), the three reading variables of each reading test increased the multiple R's for all sixteen criteria by relatively small amounts. The comparative predictive value of the independent variables of each six variable battery made in terms of the βr product revealed that for the sixteen criteria studied, high school average contributed the most to the total predicted variance in the criteria; reading comprehension was next; reading vocabulary, A.C.E.(Q) and A.C.E.(L) followed as a group of comparable variables; and reading speed contributed least.

By an analysis of variance, a clearer and more comprehensive picture was made of the contribution of measured reading to prediction in the sixteen criterion areas. The three reading variables of the Cooperative Reading Test, as members of the six variable predictor battery, accounted for a large part of the total predicted criterion variance in thirteen criterion areas. The three reading variables of the Diagnostic Reading Test, as members of the six variable predictor battery, accounted for a large part of the total predicted criterion variance in twelve criterion areas. The data on variance for both six variable predictor batteries showed conclusively that much of the contribution of reading as measured by the three reading variables was shared by the three nonreading variables of the battery, high school average, A.C.E.(Q) and A.C.E.(L).

It was found in obtaining multiple R's that when high school performance was represented by the several component predictor variables, namely, high school averages in English, mathematics, social science, natural science, foreign language, and electives, in general, more accurate predictions of university academic performance resulted than when high school performance was represented as the single predictor variable all-high school average.

152 pages. \$1.90. MicA54-1726

AN ANALYTICAL SURVEY OF PERSONNEL
PRACTICES IN FIFTY-SEVEN
INDUSTRIES IN INDIANA

(Publication No. 8392)

Jack Henry O'Neill, Ph. D.
University of Michigan, 1954

The study of this problem arose from the observation of personnel practices in a modern industry in which the writer was then employed. The differences, similarities, etc., of various practices of that organization with those of the guidance organization of a modern secondary school with which the writer had been affiliated, attracted his attention and led to the desire to study the personnel practices of other manufacturing industries of the same general type as the one in which he was employed.

A basic questionnaire was set up with the help of a group of experienced supervisors in personnel and employee relations. It was then submitted to a jury of selected personnel men whose purpose was threefold: (1) to check the questionnaire for pertinence and administrability, (2) to propose changes wherever they were deemed necessary, and (3) to make recommendations for the administration and evaluation of the questionnaire.

Questionnaires and an explanatory letter were sent to those Indianapolis, South Bend, Mishawaka, and Elkhart industries which were classified in Division D, Manufacturing, in the Standard Industrial Classification Manual. Seventy-one industries were approached and returns from fifty-seven were received and tabulated.

The data from the returned questionnaires were grouped on the basis of five categories of respondent industries.

While many interesting variations in practices were found in individual instances, the standard statistical method of testing hypotheses shows that the degrees of variation are of such proportions as to verify, at least in most cases, the conclusion that practices are more uniform than disparate in each of the five categories. We stated as a null hypothesis: There is no difference in the personnel practices, as shown by the percentages belonging to each sample, where a designated pair of variables has been fixed. The verification of this null hypothesis was accomplished by the use of Fisher t-scores.

For each table of data, the sample percentages showing the greatest critical ratios were selected and the confidence levels determined. All sample pairs giving rise to critical ratios that yielded readings of 95 percent or more, were presented in tabular form.

Industries, in general, are convinced of the need for some types of guidance services in addition to the personnel programs which may be functioning within individual plants.

Tests have not been adopted wholeheartedly by industry. When used at all they are usually used with considerable caution and as only one of several factors in the evaluation of an individual's qualifications.

Training is a function of guidance according to

writers in the field and to personnel men in industry.

Most of the participating industries provide some type of adjustment service for employees, either including, or in addition to services which the labor unions offer.

It was felt by some company representatives that if adequate "initial guidance" was carried on at the recruitment stage, adjustment to the company and the job would be facilitated.

Records are regarded as guidance instruments by practically all of the respondents and, in fact, constitute the only guidance technique used by some companies apart from certain phases of the employment process.

Industry endeavors to perform functions of initial placement, transfer, up-grading, down-grading and re-rating when it is permitted to do so.

A large number of industries provide counseling services for employees.

Induction programs in industry vary according to the felt needs of the local plant. A high number of the surveyed industries provide induction and orientation literature and programs.

In light of the almost innumerable possibilities for significant differences to occur in the situations which we have dealt with our null hypothesis has not been sustained in rather startlingly few instances. By and large, one must therefore conclude that there is a degree of "unity in diversity" of personnel practices among the fifty-seven industries which provided our data; in short, their operations reveal a loose pattern of practices within which specific variations are numerous and, as we have seen, largely governed by chance variations. 223 pages. \$2.79. MicA54-1727

PSYCHOLOGICAL CORRELATES OF
JOURNALISM TRAINING COMPLETION

(Publication No. 8481)

Anthony Truman Pouncey, Ph. D.
University of Minnesota, 1954

This investigation sought to:

(1) Determine the level and dispersion of an array of psychological measures on seniors who were completing academic training in journalism and the extent of the correlation of those variables with relative success in journalism training. The criterion of success was the honor point ratio achieved by each person in the whole of his academic journalism study.

(2) Compare a sample of communications specialists already on the job in a federal government agency with advanced journalism students.

The reasons for making this study were:

In Part 1, to establish the psychological correlates of success in a completed program of journalism training and to set up a working model for obtaining information in future investigations involving sophomore candidates for journalism training. The model emphasized the use of minimum testing time to secure maximum information. A subsidiary

purpose was to perfect a device for interpreting this information in the future so that it would be readily understandable to and acceptable by students. It was designed for use in counseling with potential journalism majors.

In Part 2, to show the similarities and differences between journalism students and an occupational group of communications specialists in the federal agency. This information should have counseling implications for advanced journalism students.

The sampling was:

(1) Every advanced student in journalism at the University of Minnesota during the spring quarter of 1953. This sample was studied for representativeness of the universe of advanced students in journalism at this institution. Included were 67 seniors and 21 graduate students.

(2) A group of 152 communications specialists recently tested by the federal government agency itself. Complete anonymity was desired. Only N's, means, and standard deviations of the test results were furnished by the agency.

The methods used were:

For Part 1, measurement of psychological variables by a battery of tests and measures lasting 5 hours 20 minutes. Numerical results were analyzed in their relationship to the criterion by multiple regression techniques.

For Part 2, significance of the difference between obtained means and variances were analyzed on 30 tests and sub-tests that had been taken by all members of the groups.

In general, the findings were:

(1) Senior journalists and graduate journalists in this sampling are significantly different subgroups and must be considered separately for analysis by the methods used here.

(2) According to their scores on verbal ability and interest measures as used in this investigation, graduate students, agency specialists, and seniors grouped themselves into a generalized score hierarchy in the order named. Assuming that higher scores on the various instruments are desirable, it appears to be justifiable to conclude from these findings that School of Journalism seniors can be considered a fair source of personnel for the government agency. On the same assumption, journalism graduates, who obtained generally higher scores than the specialists or the seniors, can be considered an excellent source of personnel for the agency.

(3) A moderately effective differentiation between the barely successful and the increasingly effective journalism seniors was made by two tests, the SRA Primary Mental Abilities and the California Psychological Inventory. An "Expectancy Predictor" devised for interpretation of the multiple correlation coefficient and multiple regression equation findings from these two tests appeared to work fairly accurately and to be readily comprehensible.

248 pages. \$3.10. MicA54-1728

PRINCIPLES AND PRACTICES OF GUIDANCE IN ELEMENTARY SCHOOLS

(Publication No. 8527)

Frank Leslie Sievers, Ph. D.
University of Nebraska, 1954

Adviser: Warren R. Baller

The Purpose and Procedure of the Study

The purpose of the study was to determine the principles and practices which are fundamental to effective elementary school guidance.

Several assumptions were basic to the development of the study. It was felt that there are principles which are particularly applicable to guidance services in elementary schools and that definite practices are related to the application of these principles. Furthermore, it was assumed that secondary school guidance principles and practices are not in themselves inappropriate to the elementary school setting. Rather, there seemed to be a need for careful consideration of all practices and principles, regardless of their source, to establish their relationship to the elementary school situation.

In broad perspective this undertaking consisted of the following main steps: (1) the search for, and tentative statement of principles and practices which pertain to elementary school guidance; (2) the securing of an evaluation and refinement of these principles and practices by guidance specialists and elementary education specialists; (3) the determination of extent to which certain principles and practices are applied and are considered desirable by staff members who are responsible for guidance services at the local elementary school level; and (4) a definite statement of principles and practices acceptable to recognized leaders in guidance and in elementary education.

The Results of the Study

The operations mentioned above resulted in a statement of twenty-seven principles and forty practices which were deemed to be descriptive of sound elementary school guidance. The principles were divided into eight categories. Five principles were related to the first category, The Nature and Scope of Guidance Services; eight principles were related to The Administrative Bases of Guidance Services; two principles came under the category, The Preparation of the Guidance Specialist; four principles were related to Services Provided in Elementary School Guidance; two principles pertained to Individual Inventory Services; three were included under the heading, Counseling Services; The Category Occupational Orientation included two principles; and the remaining two principles were listed under Evaluation of Guidance Services.

Similarly, the acceptable guidance practices were grouped into eight categories. Guidance Practices Related to Administration was a title under which six statements were listed; Practices Related to the Use

of Services included six statements; Individual Inventory Services were eight in number; Practices Related to Informational Services were five in number; five practices were identified with Counseling Services; three pertained to Auxiliary and Referral Agencies; four were related to Services Through Parents and To Parents; and three practices were related to Evaluation.

Reactions of members of the two juries to the twenty-seven principles indicated some variation in their concepts of guidance services in the elementary school. Guidance leaders tended to think of guidance as consisting of organized services in the school while elementary education specialists showed a tendency to subordinate the services to the instructional program of the school.

But, in spite of some differences of opinion regarding the acceptability of certain statements of principles the members of the juries approved, with little reservation, the following definition of guidance services in the elementary school.

Guidance services in the elementary school consist of such processes as may be employed to supplement and strengthen the regular instructional procedures in determining and meeting the individual needs of children. They include methods of appraisal of behavior and development and systematic means for achieving and maintaining desirable pupil adjustment. As processes that work coordinately with the regular program of instruction, they are not necessarily conducted by personnel other than the instructional and administrative staff; the need for specialized services is basically the determining factor in the requirement of personnel beyond that which is instructional and administrative.

388 pages. \$4.85. MicA54-1729

THE DETERMINATION OF THE RELATIONSHIP BETWEEN PERSONALITY CHARACTERISTICS AND THE NATURE AND PERSISTENCE OF PROBLEMS IN THE PROTESTANT MINISTRY

(Publication No. 8435)

John Charles Whitcomb, Ph. D.
University of Michigan, 1954

This study was stimulated by an increasing concern on the part of churchmen for the adjustment of ministers to the ministry. It was projected for the purpose of establishing the degree of relationship that might exist between personality characteristics and problems in the Protestant ministry.

The investigation tested five hypotheses:

1. There is a significant relationship between personality characteristics and problems in the Protestant ministry.
2. There is a significant relationship between personality characteristics and certain personal factors; namely, pastoral experience, age, marital status, educational status, number of children, number of brothers and sisters, father's occupation (professional versus

non-professional), experience in industry and/or the trades, age at which the decision to enter the ministry was made, and veteran status.

3. There are significant differences between the personality characteristics of seminarians and the norms for the Guilford-Zimmerman Temperament Survey.
4. There are no significant differences between the personality characteristics of seminarians and five-year graduates.
5. There are significant differences between seminarians and five-year graduates in terms of the problems which tend to disturb them.

The principle recent studies of personality and adjustment of Catholic and Protestant ministers were reviewed, and a preliminary questionnaire of ninety-nine problems of ministers was constructed. This questionnaire was submitted to 148 seminarians in Indiana and Illinois who were attending Garrett Biblical Institute. On the basis of returns by eighty-three respondents, thirty-five problems were selected for the final problem evaluation instrument.

The paired-comparisons method was used to construct a Survey of the Opinions of Ministers concerning Problems in the Protestant Ministry, consisting of seventy-two comparisons. This instrument, together with a personal data inventory and the Guilford-Zimmerman Temperament Survey, was given to 156 seminarians and ninety-six five-year graduates from McCormick Theological Seminary, Garrett Biblical Institute, Federation of Theological Schools in the University of Chicago, and Union Theological Seminary. Of the total, 108 seminarians and sixty-five graduates responded.

The writer employed the Pearson product-moment correlation and the Fisher *t* test for the differences between means in making a detailed analysis of the data. A 1 percent and a 5 percent level of significance were used to determine whether the data supported the hypotheses.

The major findings included the following: Significant positive or negative relationships existed between seventeen problems of ministers and one or more personality factors. Intercorrelations between the ten factors measured by the Guilford-Zimmerman Temperament Survey were gratifyingly low. Significant positive relationships were found between the following personal factors and one or more personality characteristics: marital status, seminary status, number of brothers and sisters, industrial experience, and age. The seminarians exceeded the norms at the 1 percent level of significance for Restraint, Ascendancy, Sociability, Emotional Stability, Objectivity, Friendliness, Thoughtfulness, and Personal Relations. Differences between seminarians and five-year graduates were statistically significant for only the Thoughtfulness factor in the personality instrument. Significant differences were found between seminarians and five-year graduates on only five problems of ministers. Of the seminarians, 80.6 percent were married and reported they had an average of 1.6 children per couple. Eighty percent reported they had one or more brothers and/or sisters. The

fathers of 97.5 percent were engaged in non-professional occupations. Almost half reported having no full-time industrial and/or trades experience. The mean age for the decision to enter the ministry as a career was 23.6 years, with no evidence of a bi-modal distribution in the teens and early twenties.

168 pages. \$2.10. MicA54-1730

EDUCATION, TEACHER TRAINING

STUDENT TEACHING IN INDUSTRIAL ARTS EDUCATION; A REPORT OF A SURVEY OF STUDENT TEACHING IN HIGHER INSTITUTIONS AND IN ON AND OFF-CAMPUS COOPERATING SECONDARY SCHOOLS: PHILOSOPHY, PRACTICES, PROCEDURES, PROBLEMS, EVALUATION

(Publication No. 8442)

William Carlisle Anderson, Ph. D.
University of Minnesota, 1954

Major Adviser: Homer J. Smith

This report is based primarily upon a questionnaire study involving one hundred nine industrial arts departments in higher institutions and one hundred four industrial arts cooperating teachers in campus and in public secondary schools. Consideration is given also to the pertinent literature in the field of student teaching, generally and in this specialty.

Questionnaire data concern the types and sizes of institutions participating. Twenty-two of these are State Universities, twenty are Agricultural and Mechanical Colleges, fifty-seven are Teachers Colleges, and ten are Liberal Arts Colleges.

Present policies in the institutions are shown in connection with various administrative practices dealing with such items as, academic and summer school credits, major and minor credential offerings, credit requirements, and courses serving as prerequisites to student teaching. Information is afforded concerning the inclusion of courses in methods and student teaching in departmental requirements. Further administrative detail is given concerning student teacher liability in case of accidents, the method of assigning persons to teach the methods courses, selection procedures used to obtain prospective teachers with good potential, and the types of first teaching position usually secured by graduates. Questionnaire forms were returned by heads of college industrial arts departments.

Additional data describe the types of campus laboratory schools in existence, as to numbers, building dates and construction costs, enrollments, means of support, and facilities for industrial arts instruction.

Pertinent information is given in connection with the use of off-campus schools for student teaching purposes about such matters as, distances, numbers, selection methods, compensations, and lengths of time of use.

The situations connected with the assignment of industrial arts college students to student teaching locations are described. These are matters of, responsibility for assignments, lengths, of time required to meet requirements, class levels covered, numbers of manipulative areas concerned, types of schools used, supervision procedures, evaluation practices, and types of professional laboratory experiences other than student teaching.

The institutions participating provided copies of certain forms used to administer the student teaching programs within their special departments. These forms are characterized under such headings as, (1) General Explanatory Bulletins, (2) Application Blanks, (3) Rating Sheets, (4) Description of Student Teacher Activities, and (5) Suggestions to Supervisors.

In a separate questionnaire, one hundred four industrial arts high school instructors, who have student teachers in their shops, provided information as to training, public school and college teaching experience, school duties, distances from their training institutions, supervision provided, and amounts of compensation received. Personal data regarding marital status, family size, and salary are also given.

On the basis of their connection with student teaching, these instructors reacted to various situational items requiring additional instructional time in order to enable student teachers to do satisfactory work. Such matters as keeping class record books, evaluating projects, making lesson plans, and arriving at course grades were included among these items.

Industrial arts department heads in colleges reacted to various items dealing with the gradation, supervision, and organization of various features of a student teaching program. These items were marked as to their desirability and as to whether they were being practiced at the time in the institutions represented.

The data throughout the text are supported by four illustrations and ninety-three tables. Differentiation is made as to four types of higher institutions and two types (campus and off-campus) of cooperating secondary schools.

On the basis of the reading, the survey data, and the professional experience of the writer various recommendations and suggestions for further study were made. Illustrative of these are matters of required courses, supervisory practices, locations for student teaching assignments, levels of assignments, and the use of seminars for coordination of activities.

480 pages. \$6.00. MicA54-1731

**A SURVEY AND ANALYSIS OF THE MOST
EFFECTIVE PRACTICES FOR THE
SELF-IMPROVEMENT OF FOREIGN
LANGUAGE TEACHERS IN SENIOR HIGH
SCHOOLS IN THE UNITED STATES**

(Publication No. 8340)

Walter Harold Campbell, Ph. D.
University of Washington, 1954

Supervisor: Dr. Homer Boroughs, Jr.

Purpose

The purpose of this study was to determine what some of the most effective practices would be for the self-improvement of foreign language teachers in senior high schools in the United States. Since the United States has been playing an international role, it was believed that one important way in which to cultivate increased respect of foreign nations would be to improve the teaching of foreign language skills in the senior high schools and to strive for a greater understanding of the culture which they represented so that the citizenry in general, and representatives abroad in particular, from all walks of American life, might have greater language competence.

Method

1. The writer read widely in the field of foreign language teaching of both the past and the present.
2. Public School Superintendents of 100 cities of 100,000 or more population were invited to participate by sending the writer the names and addresses of the following:
 - a. The foreign language director, if they had one.
 - b. Ten outstanding senior high school foreign language teachers in their respective school systems.
3. Special questionnaires designed to gather data concerning the most effective practices for the self-improvement of foreign language teachers were sent to the following:
 - a. The State Superintendent of Public Instruction in each of the forty-eight states and some territories.
 - b. The senior high school teachers whose names and addresses had been received.
 - c. Foreign language directors in forty public school systems.
 - d. A select number of governmental, inter-governmental and private agencies.
 - e. Foreign language departments in a select number of state and private universities.

Some seventy-two cities participated in the survey, but only forty indicated that they had a foreign language director; thirty-four of the forty-eight State Superintendents of Public Instruction took part; 150 college and university professors; thirty-four foreign language directors; thirty-five governmental, inter-governmental and private agencies; and 335 senior high school foreign language teachers in seventy-two cities.

Conclusions

Senior high school foreign language teachers need to improve in the following respects:

1. Ability to speak foreign languages.
2. General cultural background knowledge of the country whose language they teach.
3. Travel, study and residence abroad for a minimum of one year, preferably with a native family.
4. Increased contacts outside of school with native speakers of the language.
5. Improvement of methodology by placement of more emphasis on the oral and aural aspects and less emphasis on reading, writing and grammar.
6. An organized and continuous program for self-improvement.

Implications

1. The instructional needs of foreign language teachers are being met rather well on the university level, but university foreign language teachers are out of touch with the daily performances and problems of senior high school foreign language teachers.
2. The attitude of teachers toward their work is conscientious.
3. Foreign language teachers' morale could be boosted through support from administrators and by making occasional classroom visitations of other language teachers possible.

Suggestions to the Following Groups for Self-Improvement of Foreign Language Teachers as Gleaned from an Analysis of the Observations Submitted by the Five Groups Surveyed

1. Colleges and universities
 - a. Place more emphasis in college training on the development of an oral command of the language.
 - b. Improve the cultural background of the teachers through an organized program in colleges and universities and encourage general reading on the part of the teacher.
 - c. Have universities make closer contact with high school foreign language teachers and their problems.
 - d. Help senior high school foreign language teachers to become acquainted with foreign language laboratories.
 - e. Organize some practical foreign language workshop programs.
2. Public school administrators
 - a. Provide a foreign language director to give direction to a city-wide program of foreign language instruction.
 - b. Grant sabbatical leave to teachers for self-improvement.
3. Senior high school foreign language teachers
 - a. Take advantage of every opportunity to improve language skills by constant practice outside of the classroom.
 - b. Seek a minimum of one year of travel and study abroad, combining residence with a native family to practice speaking the language.

c. Make use of tape recordings and/or phonograph recordings of spoken material and songs, foreign language films and radio broadcasts.

d. Take an active part in regional and local meetings and strive for active membership in both local and national professional foreign language associations.

365 pages. \$4.56. MicA54-1732

**QUALITATIVE AND QUANTITATIVE
VARIABLES AFFECTIVE SUCCESSFUL
EXPERIENCE IN THE AGRICULTURAL
EDUCATION CURRICULUM**

(Publication No. 8494)

Gordon I. Swanson, Ph. D.
University of Minnesota, 1954

The general problem of the study is concerned with the extent to which successful experience in the agricultural education curriculum can be predicted by such factors as previous scholastic record and scores on tests administered particularly for prediction purposes. It also includes the effect of certain qualitative measures on the various predictive variables and the criteria of successful experience. These qualitative measures are popularly assumed to be of considerable importance to successful teaching of vocational agriculture as well as to related occupations of an agricultural nature. The study assesses their importance to successful experience in the agricultural education curriculum at the University of Minnesota.

Population and Samples. The study is based on new students entering the agricultural education curriculum of the University of Minnesota from the fall quarter of 1946 through the fall quarter of 1949. A total of 192 students were included in the study. This included all of the students for which a sufficient amount of information concerning the predictive variables and criteria could be assembled.

Procedure. The original data used in the study were obtained directly from official University records and data sheets. Data on predictive variables are obtained from the students' high school records and from batteries of tests given at the freshman and junior levels. The predictive variables included scores on the American Council of Education Psychological Examination, the Johnson Science Survey, the Cooperative English Examination, the Miller Analogies Test, the Cooperative Reading Examination, the high school rank, previous training in vocational agriculture, previous experience in 4-H Club activity, and previous membership in the Future Farmers of America.

The criteria included honor point ratios at the end of the first quarter, at the end of the first year, at the beginning of the junior year, in a series of selected technical agricultural courses, in the professional agricultural courses, and at graduation. The tests of significance includes several variations of the *t* test, the *F* ratio as developed through variance analysis and also through multiple correlation and regression

techniques. Also important to the tests of significance are the tests of the assumptions pertaining thereto.

Conclusions. The zero-order correlation coefficients between the different predictive variables and the various selected criteria revealed that when the variables were considered as individual predictors, the Miller Analogies test, The Cooperative Algebra test and the American Council of Education Psychological Examination appeared to be the most valuable. None, however, appeared to be of sufficient value to use as the sole indicator of successful experience in the curriculum. None of the correlation coefficients between the variables and the various criteria exceeded .395.

When each of the variables were combined into a seven-variable combination for multiple correlation and regression analysis, the multiple correlation coefficient was not significantly different from zero at the 5 per cent level with honor point ratio at the time of graduation considered as the dependent variable. Each of the standard partial regression coefficients were also tested for significance and none were found to contribute significantly at the 5 per cent level.

The qualitative factors analyzed for association with successful experience in the agricultural education curriculum were previous agricultural training, previous experience in the Future Farmers of America organization, and previous 4-H Club experience. There was no evidence to show that training in vocational agriculture on a pre-college level had any significant influence on successful experience in the agricultural education curriculum as measured by any of the six criteria. Similarly, there was no evidence that previous experience in either the Future Farmer or the 4-H Club program had a significant effect on successful experience in the curriculum as measured by the criteria.

171 pages. \$2.14. MicA54-1733

**INTERRELATIONSHIPS BETWEEN LANGUAGE
GUIDANCE USED BY TEACHERS AND THE
SOCIAL AND DEVELOPMENTAL
STATUS OF THE CHILD**

(Publication No. 8429)

Charles Edward Vann, Ph. D.
University of Michigan, 1954

Problem

The purpose of this investigation was to explore and discover relationships between the amount and type of language guidance used by the teachers of upper-elementary school children and selected measures of the child's physical and psychological growth. These measures were regarded as being indicative of the growth of the child as a whole. Child behavior was considered as the stimulus to the teacher's language guidance responses. Language guidance was defined as the words spoken by the teacher to the individual child, either for an educative or a disciplinary purpose, during regular class sessions. It was

assumed that in the two grades studied the oral guidance was needed in the situations in which it was used.

Method

A time-sampling technique of direct observation was used to obtain a record of language guidance spoken by the teacher. Data gathered by sampling were classified into two main categories: Positive and Negative. Each main category was divided into subtypes: Request, Command, Approval, Threat, Hurry. The sampling extended over a period of fifteen weeks (January-June, 1952). The subjects observed were twenty-two children and teacher in Grade V, and the twenty-six children and teacher in Grade VI in the University Elementary School of the University of Michigan. Measures of child growth and behavior were available in the files of the Child Development Laboratories. Measurements of social status were obtained from sociometric studies conducted by the teachers in the classrooms. A questionnaire, designed to find what type of language guidance the child preferred, was also administered by the teachers in the classrooms. The chi square technique was used to find interrelationships among measures of growth, behavior, and language guidance.

Results

Few outstanding trends of relationships were discovered. Only two significant relationships were found, both in Grade V: the child who was immature in growth and the child who was less popular received more language guidance. These small trends, both of which occurred for the younger of the two groups, show similarity to earlier results for younger children. An additional result was that, in both grades, boys received more language guidance than did girls.

A critique of the research points out that the results are reasonable in view of the inherent limitations, conditions, and factors involved.

Conclusions

1. Few outstanding trends of relationships occurred between measures of growth, behavior, and language guidance for this investigation.
2. Each child has a need for control that is unique for his design of growth and behavior in relation to his group.
3. The child of higher growth status received attention and guidance from the teacher during the educative process.
4. The method and techniques employed in this investigation are useful for further study of the growth and behavior of children in the upper-elementary grades.
5. The method and techniques employed in this study are useful for the investigation of teaching style as it is reflected in the teacher's language guidance responses to child behavior as a stimulus.
6. There is a need for testing growth concepts at various age levels and under various conditions to learn the scope of previous generalizations.

87 pages. \$1.09. MicA54-1734

EDUCATION, THEORY AND PRACTICE

RECONSTRUCTIONISM AND JEWISH EDUCATION: THE IMPLICATIONS OF RECONSTRUCTIONISM FOR JEWISH EDUCATION IN THE UNITED STATES

(Publication No. 8595)

Michael Alper, Ph. D.
Columbia University, 1954

Reconstructionism is the name of a movement in American Jewish life initiated by Dr. Mordecai M. Kaplan and developed by him and many colleagues and disciples. It is critical of all the existing major theories of Jewish life because of their failure to come to grips, philosophically and educationally, with the twofold challenge of modern democratic nationalism and modern naturalism. Reconstructionism aims to effect a creative adjustment of Jewish life to these new conditions of the modern world.

Reconstructionism is a Jewish religious movement which seeks to integrate the patterns of democracy, the naturalistic outlook, the organismic point of view in psychology, and the method and intellectual mood of pragmatism.

Reconstructionism posits the existence of a will to live as being common to all living beings, but which, in human beings becomes the will to self-fulfillment or salvation. The essence of religion is the effort of the individual and the group to discover what makes life worthwhile and to bring life into conformity with those laws on which the achievement of a worthwhile life depends. To believe that reality is so patterned as to contain the means for satisfying man's quest and need for self-fulfillment is to believe in God.

The basic postulates of Reconstructionism are that 1) The Jews are a people, One People; 2) Judaism is the evolving religious civilization of the Jewish people; 3) The Jewish people in the democratic countries live in two civilizations simultaneously; Judaism in these countries functions and should continue to function as a secondary, ancillary civilization; 4) The establishment and well-being of a predominantly Jewish community in Eretz Yisreal (Land of Israel) is requisite for the survival of Jews and Judaism in the diaspora; and 5) In the United States, the loyalty of the Jews to their religious civilization is a desideratum for the full flowering of American democracy.

From the Reconstructionist viewpoint, Jewish education aims to satisfy two basic needs of human nature in the quest for self-fulfillment or salvation—the need to belong, i. e., to have fellowship in a people with historic roots, and the need for orientation, i. e., to achieve intelligent understanding of one's place in relation to nature and society. Jewish education must thus be concerned with both the growth of the individual and the welfare of the community.

The task of Jewish education is not only to pass on the Jewish civilization but also to pass on it, via the method of revaluation and reconstruction, so as to make it relevant to the moral and spiritual needs

of Jews in the modern world. The criterion for introducing needed changes in the Jewish heritage and experience is to what extent the change helps Judaism retain its continuity, its individuality and its organic character.

The specific objectives of Reconstructionism must meet the following criteria: They must a) proceed from and be organically related to the very nature of Judaism as the evolving religious civilization of the Jewish people; b) be viewed dynamically and scientifically; c) be functionally relevant to the needs, interests and desires of the individual Jew and the Jewish community; d) be grounded in a faith in democracy and a democratic outlook on life; and 3) be grounded in a belief in God.

Because Reconstructionism views the Jewish civilization in the United States as being ancillary to the inclusive national American civilization, it recognizes the primacy of American civilization and education in its educational outlook and program. The specific objectives of Jewish education (in and through Jewish civilization in America) fall under five interrelated headings, viz., Community, Culture, Ethics, Religion and Democracy.

Because Reconstructionism recognizes the unity and indivisibility of the Jewish people throughout the world, it considers the primary Jewish civilization in Israel as being a decisive factor for the preservation and enrichment of the ancillary Jewish civilization in the United States, as in other democratic countries. The implications of this polar and reciprocal relationship for Jewish education in the United States were spelled out in the Study.

In its educational methodology, Reconstructionism emphasizes the relation of the school to the community, the importance of adult and youth education, the importance of primary experience, functional knowledge, motivation, and of learning to choose, plan and work together.

Reconstructionism applauds all efforts to coordinate, unify and communify Jewish educational efforts. Its overall major objective is to win loyal supporters of the Organic Jewish Community idea.

449 pages. \$5.61. MicA54-1735

VALUES AND INDUSTRIAL ARTS EDUCATION

(Publication No. 8919)

Elmer E. Erber, Ed. D.
Bradley University, 1954

The purpose of this study is to construct a theoretical foundation upon which the industrial arts may build, enrich, and vitalize its values and meaning, and to interpret and analyze these values and the meaning of the industrial arts within the walls of this foundation. A theory of value is formulated in regard to the nature and locus of value which is based upon the conclusions of general value theory. The formulation of this theory is followed by critical consideration of the values, processes, and meaning of the industrial arts within the context of the formulated theory.

Critical consideration is given to creative

expression and its valuative structure – to its essence, structure, and attainment; to its implications and functional operation in the industrial arts, and to its dynamic potentiality for the creation and critical examination of value within the industrial arts.

A critical analysis is given to value and the aesthetics – to the emergence, the nature, and to the realization of the aesthetic experience in the industrial arts; to the aesthetic experience as a dynamic value created within the valuative structure of creativity in the industrial arts; to appreciation, and to intelligent receptivity in the development and realization of appreciation of beauty, good craftsmanship, and design in the industrial arts.

Critical thought is given to the meaning of the industrial arts within the valuative structure of creativity – to the meaning of art, to the meaning of the industrial, fine, utilitarian, and aesthetic elements in art, to their import in the evolution of value, and to the industrial arts as a phase of the whole gamut of art.

Critical discourse is given concerning the rich potentiality possessed by the industrial arts for the creation of arts' therapeutic value, and the realization of this potentiality within the creative framework of the industrial arts.

The study is concluded with basic summations, interpretations, and conclusions concerning value, the meaning and function of art and industry in the creation of value in the industrial arts, and the values created in the industrial arts as supported by the study.

96 pages. \$1.20. MicA54-1736

A SCIENTIFIC APPROACH TO THE SOLUTION OF TECHNICAL PROBLEMS WITH APPLICATION TO TWO TECHNICAL-EDUCATIONAL PROBLEMS

(Publication No. 8234)

Ray S. Lindemeyer, Ed. D.
Bradley University, 1954

Engineering is essentially a problem-solving profession. Such problems as concern the engineer are of two general types. The first of these may be referred to as being applied or practical in nature, while the other is frequently termed basic or fundamental.

Introduction. The primary objective of this report is the explanation of the ways in which two typical problems were solved by the invention and assembly of the two units. Problem one describes a revolutionary sander device and is given as an example of the applied type of research, while problem two deals with the design and development of a special apparatus on which some dental bur testing will be conducted and is therefore given as an example of basic or fundamental research. The value of this research to persons engaged in education in general and in industrial education in particular can be readily ascertained from this study.

The first chapter is composed mainly of a library study in the area of problem-solving, in which the

objective was to investigate the type of person best at problem-solving, his education and training, and the method he uses as an aid in solving technical problems.

The results of this preliminary study were two-fold. First, a list of attributes characteristic of a person who will likely succeed in solving technical problems resulted, and second, a Problem-Solving Check List evolved. The findings were helpful in solving the technical-educational problems presented in the two chapters that follow.

Quick-Change Sander Device. In the second chapter a technical problem of practical nature is presented as an example of the "applied" type of research. This sander innovation is an invention by the writer, and a patent on it is pending. With the conventional rotary sanding device, the abrasive disc is cemented to a plate and frequently comes loose. Once it comes loose or is removed, it is difficult to replace. The Quick-Change Sander Device overcomes this objection. With it the abrasive discs can be changed readily, with no waiting for cement to set or for disc to wear out. It is the writer's contention that this invention fits a long-felt need for all persons using sanders whether in school, in industry or in the home.

Dental Bur Testing Machine. The technical

problem presented in the third chapter is an example of the "fundamental" type of research. The writer was the engineer on this research project, and it was his duty to supervise the design of apparatus, aid in the selection of instrumentation, and see that the machine was built and tested. This is, therefore, a report on the design, instrumentation, building, and try-out of an apparatus for ascertaining the relative cutting effectiveness of dental burs under varied conditions of speed and feed pressures. This is a progress report. With the apparatus in its present shape, preliminary tests are currently being performed, the results of which will indicate the direction for future research. It is hoped that ultimately a really effective dental bur design will result from this study. Progress thus far is excellent and the future looks promising.

Conclusions. The two problems presented have been solved to a degree, and there are still many improvements that can be made. Some of these improvements, together with several new problems of similar nature are currently under consideration, and the same scientific approach is believed to be applicable in attaining workable solutions to them.

This information should likewise be useful to educators, engineers, and others who are concerned with the solving of technical problems such as those presented here. 116 pages. \$1.45. MicA54-1737

ENGINEERING

ENGINEERING, CHEMICAL

THE ADSORPTION OF HYDROGEN AND CARBON DIOXIDE ON A NICKEL-KIESELGUHR CATALYST

(Publication No. 8390)

Leonard Mathias Naphtali, Ph. D.
University of Michigan, 1954

This thesis presents the results of a study of the adsorption of hydrogen and carbon dioxide on a commercial nickel catalyst which had previously been used in the study of the synthesis of methane.

The adsorption of nitrogen and hydrogen at -195°C , was measured with a manometric apparatus consisting of a stainless steel catalyst chamber connected to a glass burette and a vacuum system. A glass apparatus was used to measure the adsorption of CO_2 as a function of time at constant temperature and pressure.

Carbon dioxide adsorption was measured on hydrogen-reduced catalyst at 304°C and 440°C at pressures from 0.01 to 1 atmosphere. The adsorption of carbon dioxide was found to be small compared with the adsorption of hydrogen measured by another investigator on catalyst from the same lot. It was also found that when the catalyst was exposed to oxygen at 304°C the adsorption of CO_2 increased at low

pressures by a factor of ten. The oxygen was added in increments to a total of 70.4×10^{-5} moles per gram and the CO_2 adsorption was measured as a function of pressure after each increment.

The physical structure of the catalyst was investigated by nitrogen adsorption at -195°C . The surface area was calculated from the adsorption isotherms, by the Brunauer-Emmett-Teller and the Harkins-Jura methods, to be of the order of 100 square meters per gram. The particle size which was computed from the area and porosity was consistent with electron micrographs, and with the value of about 330 \AA obtained by R. B. Roof using the line broadening produced in an x-ray diffraction pattern.

The adsorption of hydrogen was found by a previous author to be linear in the square-root-of-time at small values of time, and this was regarded as evidence of the occurrence of diffusion. It was concluded that linearity of the square-root-of-time plot can result from several processes without the occurrence of diffusion. It is also shown that the equilibrium hydrogen adsorption can be correlated with pressure by Langmuir isotherms assuming the dissociation of hydrogen on an energetically homogeneous surface. The same equation results from the assumption of molecular adsorption on a heterogeneous surface having a Gaussian distribution of energies of adsorption.

The conclusions may be summarized as follows:

- (1) CO₂ adsorption is weak at high temperatures if the catalyst is reduced.
- (2) CO₂ adsorption is increased by the addition of oxygen to the reduced catalyst.
- (3) Oxygen content is probably an important variable in the study of the reactions of CO₂ on a nickel catalyst.
- (4) The particle size of the catalyst was estimated to be 330 Å, indicating the absence of pores small enough to cause the slow hydrogen adsorption.
- (5) The fact that adsorption is linear in square-root-of-time does not necessarily signify diffusion.
- (6) The adsorption of hydrogen can be correlated by Langmuir isotherms assuming dissociation on the surface.

171 pages. \$2.14. MicA54-1738

ENGINEERING, CIVIL

AN INVESTIGATION OF CONTINUOUS CYLINDRICAL SHELL ROOF STRUCTURES OF ANY NUMBER OF SPANS WITH DIFFERENT TYPES OF LOADING AND BOUNDARY CONDITIONS

(Publication No. 8423)

Chi-Kun Tao, Ph. D.
University of Michigan, 1954

As suggested by the title of this dissertation, a complete solution of continuous cylindrical roof shells of any number of spans under different types of loading is given. This is achieved by the use of the basic equations for cylindrical shells in the sense of Love's first approximation, and appropriate boundary conditions which gave rise to a set of simultaneous linear equations. The latter equations are solved by the matrix method.

For the boundary conditions in a complete discussion of all possible cases is presented in a straightforward way. Studies by Byrne and Timoshenko are helpful in this respect. Byrne derived a set of boundary conditions of considerable generality. The statement of the boundary conditions given in the recent American Society of Civil Engineers Manual No. 31 for a multiple shell (a continuous shell of equal span lengths) appears to be at best an approximation. For continuous shells of unequal span lengths, they are not applicable at all. It seems that the so-called flexural constants method devised by U. Finsterwalder and followed by most shell designers to satisfy the boundary conditions at an elastic support is rather an unnecessary complication.

With regard to the homogeneous solutions, of the three uncoupled differential equations, two major features may be mentioned. First, by the method of separation of variables, the partial differential equation of radial displacement is reduced to two ordinary differential equations, whose solutions are immediate

in terms of exponential functions and trigonometrical functions. Secondly the complex exponential functions are transformed into hyperbolic functions so that the principles of symmetry and antisymmetry can be applied by an examination of the functions involved.

With regard to the particular solutions, they are completely worked out for five types of useful loadings, namely, the dead load, the snow load, an anti-symmetrical pressure load,* the partial live load, and the concentrated load. These solutions afford a chance to examine the accuracy of the membrane theory.

According to the prescribed boundary conditions, a matrix form for a five span continuous cylindrical shell with symmetrical loading is set up. A simple matrix method for solving systems of linear equations is given in the appendix I. By means of solving the resulting simultaneous equations, it has been made possible to supersede the usual method of satisfying the boundary conditions by applying the various boundary forces or line loads one by one. This usual method is readily applicable only to a single span in view of the complicated conditions at the continuous edge. Having reduced the matrix, the mathematically correct solution of this multi-redundant problem has been achieved. Further to increase the usefulness and practicability of these solutions, they are obtained in terms of dimensionless parameters, thus making them available for the complete range of span, length, thickness, radius or central angle.

Finally, two practical examples, one for a single span roof shell and one for a three span continuous roof shell selected from the American Society of Civil Engineers Manual No. 31, are given and comparison of the results is made with the solutions of this manual. 234 pages. \$2.93. MicA54-1739

*leads to a simulated windload.

ENGINEERING, ELECTRICAL

A STUDY OF THE INITIAL PERMEABILITY OF FERROMAGNETIC METALS AT HIGH FREQUENCIES

(Publication No. 8377)

Paul Rowley McIsaac, Ph. D.
University of Michigan, 1954

The purpose of this study is to investigate theoretically the processes occurring in ferromagnetic metals in the frequency range of 50 to 1000 mc which contribute to the initial permeability, and to evaluate the relative importance of these processes to the high frequency behavior. An understanding of these phenomena is essential for the most efficient use of ferromagnetic metals in high frequency applications and for the development of new materials designed especially for such applications. Quantitative results are obtained for both iron and nickel.

Static 180° domain walls are studied by investigating those structures for which the wall energy is a minimum. An evaluation is made of the influence of static magnetic and demagnetizing fields, uniform stresses, and a finite domain size on the domain wall energy and the effective wall width. In iron, the domain wall properties are influenced strongly by demagnetizing fields but relatively little by stresses. The reverse is true for nickel; stresses are important, but demagnetizing fields are not. The resistance to bending of a domain wall is also investigated.

By considering the torques acting on the magnetization within a domain wall, and utilizing the fact that for small fields a moving wall has almost the same structure as a static wall, the properties of an oscillating domain wall can be determined. The origin of the inertia of an oscillating domain wall is clarified, and the relative magnitudes of the localized eddy current and the Landau-Lifshitz damping are obtained. An evaluation is made of the influence of static demagnetizing fields, uniform stresses, and a finite domain size on the apparent wall mass.

The relative effects of wall inertia, damping, restoring forces, wall stiffness, skin effect, and domain size on the wall motion are determined for a simplified model of the domain structure. The wall stiffness has no appreciable influence on the wall motion at high frequencies; the motion is determined primarily by the domain structure and size, the damping, and the restoring forces. In nickel, both eddy current and Landau-Lifshitz damping are significant, but in iron only eddy current damping is important. The domain wall motion and domain rotation are combined to give the high frequency permeability of the model.

A few general conclusions may be drawn from this study. First, the study indicates that the domain dimensions in those specimens for which data on the high frequency permeability are available are of the order of 10^{-4} to 5×10^{-4} cm. Second, because the apparent wall mass is proportional to the static wall energy, the influence of static forces on the wall motion can be evaluated by investigating their effect on the static wall structure. Third, no trace of a domain wall resonance is observed experimentally because it is obscured by the combined effect of the domain rotations and the skin effect. Finally, to completely determine the processes occurring at high frequencies in ferromagnetic metals, it is necessary that a wide range of experiments be performed on a single specimen. 196 pages. \$2.45. MicA54-1740

THE TRAJECON - AN EXPERIMENTAL DC MAGNETRON

(Publication No. 8396)

William Wesley Peterson, Ph.D.
University of Michigan, 1954

An experimental study of the dc cylindrical magnetron is described. An electron beam parallel to the axis of the magnetron is injected into the magnetron

space charge close to the cathode surface at one end. The beam is deflected by the fields in the magnetron, and its exit point shows on a fluorescent screen at the other end of the magnetron. Through a study of the beam deflection, significant information about the electric field in the magnetron can be obtained.

According to the most widely used theory of the dc magnetron in the cutoff condition, the space charge is confined to a region between the cathode and a maximum radius commonly called the Hull radius. Results of this experiment indicate that the amount of space charge outside the Hull radius, far from being negligible, exceeds that within the Hull radius in many cases. The space charge outside the Hull radius consists primarily of electrons whose momentum or energy have been changed from initial values by collisions or irregularities in the fields, in such a manner that these electrons are trapped within the magnetron. Such space charge has sometimes been called secular space charge.

Calculations of beam electron orbits indicate that if the space charge in the magnetron agreed with the classical theory of the magnetron, it would be possible to determine from a study of the beam spot observed in this experiment which of the several possible types of orbits actually occur. Attempts to determine which of the classically possible orbits occur, or to find evidence of transitions from one type of orbit to another, indicate that the actual behavior does not correspond to any of the classically predicted behaviors. There is apparently so much secular space charge relative to that in the stream emitted from the cathode that the latter has very little effect on the probing beam.

Control experiments are described. On the basis of these experiments, the electron probe technique and its limitations are discussed.

265 pages. \$3.31. MicA54-1741

A STEP-BY-STEP METHOD FOR THE TRANSIENT ANALYSIS OF NONLINEAR FEEDBACK SYSTEMS

(Publication No. 8419)

Thomas Melville Stout, Ph. D.
University of Michigan, 1954

In the analysis and design of engineering systems, it is sometimes necessary to calculate for a prescribed input the transient response of a physical system containing a non-linear element. A new analytical-numerical-graphical method is proposed in this thesis for carrying out such calculations.

In order to unify the treatment of different kinds of dynamic systems, the basic equations are first represented in block diagram form. Using block diagram transformations suggested by Graybeal, the original diagram is then reduced to a standard form for analysis. The standard block diagram consists of input and output blocks expressing linear dynamic relations, separated by a feedback system composed of two blocks: a forward block which describes an instantaneous nonlinear relation between two variables, and a

feedback block which represents a linear dynamic relation.

The output of the input block is determined by solution of a linear differential equation. The output of the feedback system is calculated step-by-step, using the following procedure. By means of the superposition integral, the output of feedback block is expressed as a weighted sum of its unknown present input and its known past inputs. The present input is the output of the nonlinear forward block and is a function (expressed by a characteristic curve) of a known input to the feedback system and the partially unknown output of the feedback block. To satisfy the relations between the present values of the variables, two equations are solved graphically using the same construction employed in the analysis of vacuum tube amplifiers with resistive loads. The final output is found by any convenient method.

Certain variations of this general procedure may be encountered. The weighting function for the feedback block is its response to a unit impulse and might contain impulsive components; this difficulty can be avoided by interchanging the forward and feedback blocks in a prescribed manner. If the initial value of the weighting function is zero, the graphical solution is unnecessary. Three electric circuits and two servomechanisms, chosen to illustrate the general process and possible variations, are treated by the proposed method and checked experimentally.

Unlike some similar methods advanced by Tustin and Madwed, this method does not require resolution of the variables into step, pulse, or other component signals, or the substitution of difference operators for differential operators. The superposition integral is evaluated by common numerical methods, with the result that standard formulas can be used to estimate bounds for the integration errors. This fact makes it possible to select the step interval for any desired accuracy and, for nonlinear problems, to render integration errors negligible with respect to the errors in the graphical solution.

Three appendices contain general material on block diagram representation and reduction for linear and nonlinear systems.

230 pages. \$2.88. MicA54-1742

ENGINEERING, HYDRAULIC

WAVE HEIGHTS WITHIN A HARBOR DUE TO SWELL ENTERING THROUGH A BREAKWATER GAP

(Publication No. 8398)

Melville Stanton Priest, Ph. D.
University of Michigan, 1954

The general effectiveness of breakwater systems in reducing wave height within a harbor is an important problem facing those engineers concerned with harbor development. Although recently presented theories have made substantial contributions to an

understanding of the problem, the engineer may find it difficult to analyze a problem based upon actual conditions. In practice reliance has been placed upon model studies of individual cases. Although this procedure is the most satisfactory solution, it is costly in both money and time. In order to arrive at a practical solution encompassing many of the common aspects of the problem, the writer undertook an experimental study and analysis leading to mathematical relations describing the variations in wave height shoreward of a breakwater gap. In effect, the objective was a solution that would be of value to the practicing engineer.

The study made use of a wave basin in which waves were generated by means of a movable wave generator of the vertical plunger type. Breakwater faces were vertical. Wave guides were used to conduct the waves to the breakwater gap. Wave energy which was not intended to enter the harbor was dissipated by gravel ridges. Similar ridges were used to minimize reflection of wave energy within the harbor. Wave height was measured by means of an electrical device known as a resistance staff.

Pertinent quantities were related through an implicit function of dimensionless parameters. These parameters were such as to account for the effects of incident wave steepness, gap width, stillwater depth, divergence of breakwaters, oblique incidence, and shoaling upon relative wave height within the harbor. The procedure was such that the effect of varying each of the parameters might be considered as a correction or deviation from a set of reference conditions.

Examination of the experimental data revealed:

- The diffraction pattern might be considered as symmetrical with respect to a vertical plane passing midway between breakwater tips.
- The relation between relative wave height in the plane of symmetry and relative horizontal displacement in that plane, from midway between breakwater tips, might be expressed through an exponential function.
- The relation between relative wave height and relative displacement normal to the plane of symmetry, for particular values of relative wave height in the plane of symmetry, might be expressed through a function of the probability class. These functions contain secondary functions of the parameters which describe the incident waves, breakwater arrangement, stillwater depth, and bottom slope. The secondary functions were determined by processes of curve fitting and expressed through generalized equations.

The generalized equations enable computation of relative wave height at arbitrary locations within a harbor and construction of diffraction diagrams. Although this study was bounded by experimental limits and could not possibly cover all conditions that might arise, it is the writer's belief that the range of experimental data and scope of the study are such that a substantial contribution has been offered to practical harbor engineering. The generalized equations are based directly upon experimental data, the scope of the study was broader than that of any previous study, and application of the equations requires no more than a knowledge of the mathematics required of undergraduate engineering students.

126 pages. \$1.58. MicA54-1743

ENGINEERING, MECHANICAL

THE FLOW OF SATURATED WATER AND
OF COLD WATER THROUGH A VALVE

(Publication No. 8378)

Donald Bawden Mackay, Ph. D.
University of Michigan, 1954

The object of this investigation was to determine and compare the flow characteristics of both saturated water and of cold water while passing through a valve. The importance of this problem may be judged by the difficulties that have been encountered in the proper sizing of valves and orifices in processes where saturated liquids must be handled.

A simple though effective apparatus was constructed in which a certain quantity of water was heated to the saturation point and then caused to flow through a test valve. The flow rate was determined by the volume of fluid passing through the valve in a given period of time. The valve had an orifice diameter of 0.707 inch and was especially designed so that pressure and temperature measurements could be taken at the inlet section and at several stations in the discharge end. The valve body and plug were designed so that the valve lift could be changed, yet accurately positioned and measured for each test. Tests were conducted at several valve inlet pressures ranging up to 132 psia (348 F). Special thermocouples with an outside diameter of only 0.034 inch were developed and inserted into the water stream to measure its temperature.

The water was found to be in a metastable state while passing through the restriction of the valve and, as a result, the flow was retarded by an amount which in turn depended upon the extent to which the change of phase had been completed in the critical section. If little change had taken place, the flow rate approached that of cold water. In this investigation the flow of saturated water was found to be from 2 to 35 percent less than that of cold water for identical pressures. The reduction depended upon the valve lift and the head. The volume rate for the fluid passing through the valve was found to be independent of the initial pressure. It varied only with the pressure drop effected in the valve when this pressure drop was expressed in an equivalent head measured in feet of inlet fluid. An appreciable recovery of the pressure drop across the valve restriction was observed for cold water but a negligible amount was found for saturated water.

As a result of this investigation the performance of actual valves can now be more accurately predicted. However it is expected that the flow characteristics of saturated water through a given valve is influenced both by the size of the valve and by its configuration, and future work should be done to determine the magnitude of these effects.

168 pages. \$2.10. MicA54-1744

EFFECT OF NON-LINEAR PROCESS
ELEMENTS ON THE STABILITY OF
CLOSED LOOP CONTROL SYSTEMS

(Publication No. 8489)

Chi-Neng Shen, Ph. D.
University of Minnesota, 1954

Industrial processes to which automatic controls are commonly applied may be grouped under level, thermal and pressure types. The fluid level system can be considered as representative and is covered by the analysis. Such systems consist essentially of tanks which can be treated as capacities and connecting piping which restricts the flow between tanks and can be treated as resistances. The processes elements which are involved are the equivalent of non-linear capacities and non-linear resistances. The types of resistances that are found in practice are the linear type and resistances which are proportional to the square root of the flow rate. The capacity elements can assume a wide range of forms. The treatment which can be handled analytically is that which contains a linear and a cubic term.

Since the emphasis in this thesis has been on methods of analysis, two element process systems have been studied. Since proportional control is widely used, it has been considered separately in each case. The general case using a combination of all three basic types of control has also been included. An analysis using a step change in process load and a sinusoidal process load variation will give the necessary background material to evaluate the stability and time-displacement, phase relation, or other significant characteristics of the system.

The results of analysis show the barrel shaped unit, subjected to a step change, results in a higher amplitude of oscillation and a faster response or shorter period of oscillation. The neck type capacity or tank subjected to a step change is stable and gives a lower maximum amplitude of oscillation and has a slower response, hence, longer period of oscillation. Both of these systems have limited response to a sinusoidal change. The neck shaped capacity is preferable since it always gives stable conditions under either step or sinusoidal changes. The neck shape also does not have a critical frequency.

The analysis of this problem cannot be made directly on the basis of non-linear methods developed in other fields. It has been necessary to use numerous transformations to reduce the equations to forms which can be analyzed or solved. The more important developments in this thesis can be summarized as follows: The non-linear system treated differs from the Duffing's equation in that the process capacity introduces the cubic term in the second derivative. The solution to this equation with step response has been transformed to a form which results in a solution in terms of elliptic integrals. An approximate solution of the system when subjected to a sine disturbance has been obtained in series form. A solution for the stability of the system has been

determined by the first variation method by using a suitable transformation of variables. This leads to a second order linear differential equation with periodic coefficients. The existence of a periodic solution to this equation with periodic coefficients has been determined by three methods: First, the perturbation method if the non-linearity is small; second, the Hill's determinate; third, the Enzo Cambi method by continued fraction. Systems with non-linear resistance lead to two distinct differential equations: each holds true for a certain range of the dependent variable. An interesting result for the sinusoidal response is that a forced frequency of half the critical frequency can excite the second harmonic of that frequency. 356 pages. \$4.45. MicA54-1745

A STUDY OF SOME FACTORS AFFECTING ELEMENT TIME IN MANUAL WORK

(Publication No. 8490)

Newman Siegler, Ph. D.
University of Minnesota, 1954

In view of the proliferation of systems of pre-determined element times and the growth of the importance of accurate time standards there is a need for inquiries into the determinants of elemental times. This study represents an approach to that problem.

A set of artificial operations, the elements of which were defined by definite physical events, were examined to determine the effect of changes in the length and composition of the cycle upon the time for performance of the individual elements. The uniformity of element times across operations, changes in the distribution of element times within an operation when the pace was changed, and the temporal consistency of various characteristics of performance were also investigated.

An economic method of recording element times, based on the use of a high speed flash to photograph a microchronometer, was developed.

The decisions stated below were arrived at on the basis of analysis of variance and other statistical techniques. Their validity is therefore limited by the deviations of the actual system from that assumed in the mathematical model.

It was found that alterations in the content of operations resulted in changes in the times for performance of component elements, but that the primary determinant of the direction and magnitude of the change was the person performing the task. This holds true for performances at maximum and normal pace. Also, that the distribution of element times within an operation changes when the pace is changed; that the pace at a subjectively established normal pace does not bear a constant ratio to a person's maximum performance; and the relative residual cycle to cycle variability, measured by the coef-

ficient of variation, does not differ significantly between maximum and normal pace.

308 pages. \$3.85. MicA54-1746

ENGINEERING, METALLURGY

THE CUBIC TO TETRAGONAL DIFFUSIONLESS PHASE CHANGE IN THE GOLD-CADMIUM SYSTEM

(Publication No. 8628)

Chih-Wen Chen, Ph. D.
Columbia University, 1954

The diffusionless phase change in gold-cadmium alloys containing 49-50.25 atomic percent Cd has been investigated by metallographic and x-ray methods. The high temperature β_1 phase has the Cs-Cl structure. From a study of the crystal symmetry by the back-reflection Laue method, the structure of the low temperature β'' phase has been determined to be tetragonal of the point-group $\frac{4}{m}$. The ratio of the lattice parameters of the tetragonal structure has been precisely determined for the alloy containing 50 atomic percent Cd to be $\frac{c}{a} = \frac{3.2887}{3.3356}$ at 20°C by oscillating-crystal method. Oscillating-crystal films taken in a cylindrical camera facilitate the calculation of the identity periods along lattice rows in the β'' phase. From the results of the calculation of the identity periods, three possibilities of the actual size of unit cell of the tetragonal structure are derived. These possibilities are discussed with respect to the observed reflections in the powder patterns.

The transformation occurs in the temperature range from 35 to 25°C on cooling. A hysteresis of a few degrees Centigrade has been observed in the transformation temperatures. Without an applied stress, a single crystal specimen of the high temperature phase transforms to either a twinned or a polycrystalline specimen of the low temperature phase, depending upon whether the transformation starts with a single interface or with a multiple interface. But a single crystal specimen can be produced in the β'' phase under an applied stress. Reversible transformation always brings back a single crystal of the high temperature phase with the original orientation. Conditions for the transformation by a single interface have been established. A twin-related banded structure is clearly observed in the transformation products. The ratio of the relative amounts of twins is approximately unity. The habit plane, determined by a vector analysis method from the traces of plane interface on two specimen surfaces, has been found to be irrational and about $9\frac{1}{2}^\circ$ from a cubic {100} plane. By a similar analysis of the sub-band traces, the twin plane has been determined to be $1\frac{1}{2}^\circ$ from a cubic {100} plane. The results of the calculation of identity periods in the β'' phase also reveal that $\langle 100 \rangle$ in the cubic phase is approximately parallel to $\langle 100 \rangle$ in the tetragonal phase.

This investigation furnishes strong evidence for the validity of a new theory of the formation of transformation products in diffusionless phase changes in solids proposed by Wechsler, Lieberman and Read. This new theory predicts important transformation characteristics such as habit and twin planes and the relative amounts of twins from a knowledge only of the crystal structures of the initial and final phases. Good agreement has been obtained between the experimentally determined and theoretically calculated values of these transformation characteristics. The diffusionless phase change of this alloy is thus accurately described by the theory as a transformation performed by twin-related pure distortions. An interesting feature of the transformation is that one of the existence conditions derived from the criterion for the interface plane is barely satisfied. No solution is obtained for the habit plane when any of the lattice parameters of the two phases is changed unfavorably by a very small amount. A stereographic projection method, based on the new theory, is presented for the determination of the habit plane. This graphical method brings out in a particularly clear way the physical significance of the criterion for the occurrence of transformation.

63 pages. \$1.00. MicA54-1747

ORDERING AND MAGNETIC ANNEALING OF THE 50 IRON - 50 COBALT ALLOY

(Publication No. 8772)

Richard Carleton Hall, Ph. D.
Lehigh University, 1954

The 50 iron - 50 cobalt alloy has a disorder-order transformation and shows a marked increase in the ratio of residual to saturation induction as a result of annealing the alloy in a magnetic field, sometimes called a response to a magnetic anneal. The purpose of this investigation was to understand the mechanism of the ordering reaction, the nature of the response to a magnetic anneal, and the relation between ordering and the response, if any.

These problems were approached by initially producing a disordered structure by quenching through the ordering temperature range. Specimens were isothermally annealed at several temperatures in the ordering range for increasing lengths of time. Different conditions of the applied magnetic field at the annealing temperature included a) no field, b) field on cooling only, c) field during holding and on cooling, d) field continuously during heating, holding, and cooling, and e) field during holding only. The magnetic properties measured included the magnetization curve, the saturation induction, the residual induction, the ratio of the residual to saturation induction, and the coercive force. X-ray analyses were made to determine the intensity of the ordered line (indication of the relative amount of long range order) and the distance between ordered planes. Magnetostriction tests were also made.

Comparison of the intensity of the ordered line with the ratio of the residual to saturation induction

indicated that the ratio might be taken as a measure of the amount of order present in the alloy. By a mathematical analysis of the ratio, ordering took place in two stages. The main reaction in the first stage seemed to be atomic interchange while the most prominent reaction in the second state appeared to be nucleation and growth. The latter mechanism was most noticeable at long times and low temperatures while the atomic interchange reaction was most prominent at short times and high temperatures. The coercive force reached a maximum in the second stage as a result of strains associated with the coherent nucleation and growth reaction. The maximum coercive force value was inversely proportional to the temperature of ordering. The saturation induction increased slightly with ordering.

The maximum response or increase in the ratio of residual to saturation induction from the disordered condition was associated with annealing to a high degree of order with the continuous application of a magnetic field. Some increase in the ratio was observed on ordering with no applied field. A corresponding increase in the ratio at a higher level was found when the field was applied on cooling only. In the second stage of ordering a slightly greater increase in the ratio was observed when the field was applied continuously. The response was proposed to be due to two factors including a decrease in 90 degree domain boundaries resulting from the applied magnetic field and an increase in anisotropy as a result of one or two types of tetragonality developed during ordering. The increased anisotropy was thought to increase the ratio by making domain boundary movement more difficult while fewer 90 degree domain boundaries prevented easy reversals of the direction of magnetization. The further slight increase in ratio during the second stage of ordering with a continuously applied field was believed to result from the field causing the ordered phase to develop in a preferred direction such that a preferred direction of tetragonality was produced.

Magnetostriction analysis indicated that higher values were obtained when no magnetic field was applied during annealing. Increased values of magnetostriction with annealing may have resulted from increased strains, greater ordering, or, more probably, increased tetragonality.

75 pages. \$1.00. MicA54-1748

THE EFFECT OF HEAT TREATMENT ON THE STRUCTURE OF A COMMERCIAL TITANIUM-RICH ALLOY

(Publication No. 8397)

Charles William Phillips, Ph. D.
University of Michigan, 1954

A commercial alloy of titanium, Ti-150A, containing 2.22% chromium, 1.01% iron, 0.68% aluminum, 0.20% oxygen, and 0.063% hydrogen, was studied to determine its response to various heat treatments.

The heat treatments employed were (1) establishment of practical phase equilibrium, (2) cooling from

the single-phase all-beta condition at rates ranging from brine quenching to furnace cooling, (3) reheating for times from 0.1 to 120 hours at temperatures from 400 to 1600°F after brine quenching, and (4) isothermally transforming from 0.001 to 23 hours at 700 to 1650°F. Conventional methods of investigation, including optical and electron microscopy, microhardness testing, dilatometry, and x-ray diffraction were used.

Under conditions of practical equilibrium the alloy consists of the phases, alpha (hexagonal close-packed) + beta (body-centered cubic) + TiH (face-centered cubic) below 1200°F, alpha + beta between 1200 and 1775°F, and a single phase, beta, above 1775°F. The beta-phase composition varies considerably throughout the two- and three-phase ranges, and alloy properties are thereby controllable. No evidence of intermediate phases rich in iron or chromium was observed. The TiH phase exhibits various characteristic microstructural shapes, depending on the nature of the alpha-beta matrix. The all-beta structure is coarse grained.

A martensitic transformation occurs on rapid cooling of beta with an alloy content lower than that obtained by equilibrium holding at 1550 to 1575°F or above, to produce a product called alpha', which has the hexagonal close-packed structure of alpha, but is supersaturated with the alloys present.

The beta phase also transforms by nucleation and growth into a two-phase alpha + beta structure on slow cooling or on isothermal transformation above the M_s temperature.

The alpha' produced by rapid cooling of beta is capable of moderate precipitation hardening on heating to the 550 to 700°F range with rejection of the alloys held in solution during the transformation of beta into alpha'.

The main conclusions drawn were: (1) Properties of Ti-150A may be appreciably altered by heat treatment. (2) Alteration in properties occurs through variation of proportions and compositions of the four phases, alpha, beta, alpha', and TiH. (3) The beta phase, which exists as a single phase above 1775°F, decomposes either by nucleation and growth to produce a two-phase alpha + beta structure, or by a martensitic transformation to form alpha'. (4) Alpha' is capable of moderate precipitation hardening in the range 550 to 700°F, the precipitate probably consisting of beta coherent with alpha'.

194 pages. \$2.43. MicA54-1749

ENGINEERING, MINING

FRAGMENTED MATERIAL BEHAVIOR IN VERTICAL CONTAINERS OF CIRCULAR CROSS-SECTION

(Publication No. 8602)

Süleyman Vedat Aytaman, Ph. D.
Columbia University, 1954

The flow of ore in chutes is a major problem in the mining industry. It affects costs, introduces hazards and impedes production from the stopes. In an attempt to determine the laws governing flow the behavior of dry granulated sand in steel pipes was experimentally studied.

The flow of fragmented material in vertical pipes is governed by the relationship between material size, container opening and height of material. The ratio of the container size to material size is found to be one of the important factors, heretofore neglected in deep bin designs and other researches in granular media. This ratio is called (m) for easier reference.

This work establishes the existence of a limit for m beyond which flow will occur no matter how high the pipe enclosed material column. For sand this limit lies between $m = 4.00$ and $m = 4.21$, called $m = 4.21$ - for easier reference. For m values less than 4.21- the critical height of material that causes the material to "hang" is computed from the formula:

$$h = \sigma D m$$

and free flow will be obtained for heights up to this critical height.

This work further establishes that the fragmented material flow in vertical containers occurs in three ranges:

- a no-flow range, where flow never occurs,
- a probable-flow range, where flow may or may not occur, and,
- a free-flow range, where flow always occurs.

These flow ranges are governed by the relationship between the radial pressure exerted by the material arch, the weight of the arch structure and the radial pressure necessary to provide equilibrium. The radial pressure exerted by the material arch is governed by m and varies inversely with it. The radial pressure necessary to provide equilibrium also is governed by m, but its variation is direct. This relation, however, is not a straight line one. A small increase in m necessitates a comparatively large increase in radial pressure under equilibrium conditions. When radial pressure necessary to provide equilibrium is equal to or less than radial pressure actually exerted by the material, a stable arch results: this occurs in the probable and no flow ranges. When radial pressure necessary to provide equilibrium is greater than the radial pressure actually exerted by the material, stable arch does not result: this occurs in the free flow range.

Other contributions that throw light upon the mechanism of force transmission in granular media in vertical containers may be summarized as follows:

1. The effect of vertical pressure is confined to a small distance below its point of application.
2. The arch rise varies directly with m and inversely with the applied pressure.
3. The total arch height for a given m is

constant and independent of pressure and material height.

In addition, this work establishes the fact that the flow values obtained in vertical pipes are valid for pipes inclined at 40° to 90° to the horizontal.

74 pages. \$1.00. MicA54-1750

GEOGRAPHY

ARTIFICIAL DRAINAGE IN BLUE EARTH COUNTY, MINNESOTA

(Publication No. 8516)

Bert Earl Burns, Ph. D.
University of Nebraska, 1954

Adviser: Leslie Hewes

Blue Earth County, Minnesota, is located in the south central portion of the state within the Mankato Lobe of Wisconsin glaciation. It is near the northern limit of the area of intensive tile drainage within the Northern Wet Prairie. The landscape is characterized by a level plain, consisting of materials of lacustrine, glacial drift, and outwash origin, interspersed with indistinct recessional moraines. Level topography and subsoils of limited porosity have caused deficient natural drainage, as shown by shallow lakes, marshes, and wet prairie. The use of modern soil series equivalents of the soils recognized in the old, broad-gauge soil classification indicates about 58 per cent of the area to have been poorly drained. Other evidence, however, shows that the amount of land too wet for successful cultivation prior to artificial drainage was considerably less than 50 per cent of the area. For example, the total acreage of drained land plus land needing drainage reported in the 1920 census was about 170,000 acres, or a little more than one-third of the land area of the county.

Before drainage, farms contained sizable areas of unimproved land, and wild hay was produced from wet land while tilled crops were limited to better drained areas. Fields were small and irregular in shape. Despite the large amount of poorly drained land, settlement was well distributed, a situation made possible by the generally patchy distribution of poor drainage. However, at the time of mature settlement a number of farm-sized plots in wet areas were without farmsteads. Tax valuation was low in wet areas and highways showed some avoidance of wet areas.

Drainage outlet enterprises were established first in 1898 in the form of open ditches or buried tile. By 1953, 38 per cent of the farm land was included in drainage districts. Drainage districts are authorized by the County Board of Supervisors or by the District Court in response to petition by interested individuals. Costs are assessed against

landowners according to benefits received and ranged from less than \$1.00 an acre in early years to more than \$30.00 an acre in 1953. Field tile are installed by the individual farmer and vary in spacing with wetness of the land. Maximum installation may be at 90 to 100 foot intervals at a cost of \$85.00 an acre in 1953. Probably most, but not all, of the land in enterprises was drained artificially. Probably fully one-third the artificially drained land is outside drainage districts and has resulted from individual or unofficial cooperative action.

The most common results of artificial drainage upon the agricultural occupancy of Blue Earth County, as determined largely from evaluation of census data and investigation of sample farms, are (1) an increased proportion of tillable land, (2) a decreased proportion of wild pasture or wasteland, (3) a decrease in acreage of wild hay, (4) regular and dependable cropping, (5) the fitting of drained land into a crop rotation plan with increased diversification, (6) larger, rectangular fields, which lend themselves to mechanical handling, and (7) an increase in land value. These changes have been significant in the development of a rural economy typical of corn belt agriculture. In addition, drainage has facilitated heavier farmstead density in former wet areas and has eliminated numerous highway meanders. Although a considerable amount of land remains to be drained, the success of drainage indicates a likely continuation of that activity.

241 pages. \$3.01. MicA54-1751

AN INVESTIGATION OF SELECTED PHASES OF SAMPLING TO DETERMINE QUANTITIES OF LAND AND LAND-USE TYPES

(Publication No. 8367)

Rodney Steiner, Ph. D.
University of Washington, 1954

A deficiency of adequate sampling techniques seriously limits efficient acquisition of field data by geographers and others concerned with phenomena such as land and land-use types. The approach to this problem in this study was through the repeated testing of alternative sample designs in a variety of field situations. By means of a series of such experiments, this study provides information to be used directly in improving sampling methods, and

indirectly in delimiting problems of sampling methodology with regard to land and land-use types.

The series of experiments conducted in this study were pertinent to the solution of five problems: (1) the effect on sampling accuracy of the size of areas occupied by land and land-use types, (2) the effect on sampling accuracy of the distribution of land and land-use types, (3) the relative desirability of line and area dimensions of sampling units, (4) the relative desirability of non-stratified random and systematic methods of locating sampling units, and (5) the amount of sampling required for acceptable reliability.

For the purposes of the study, soil types were selected to represent land types, and forest types were selected to represent land-use types. The study area, located in northwest Washington, comprised 1875 square miles. A complete coverage of this area by soil type maps (U.S. Department of Agriculture) and forest type maps (Pacific Northwest Forest and Range Experiment Station) provided all experimental and control data.

A variety of sizes and distributions of soil and forest types were measured by means of samples. These samples were of four kinds: randomly-located lines (traverses), randomly-located areas (rectangles), systematically-located lines, and systematically-located areas. Twelve sizes of each kind of sample were employed.

To increase reliability, the original experiment was repeated twice, as an alternative to utilizing techniques involving standard error and related characteristics.

The major conclusions of the study were as follows: (1) the ratios of sample size-sample accuracy generally were promising in regard to the use of sampling in place of complete area coverage; (2) the size of land and land-use types affected sampling accuracy to such a degree that allowances for type sizes are desirable in sample design; (3) the size of land and land-use types exerted a greater effect on sampling accuracy than did distribution of land and land-use types, dimension of sampling units, or method of locating sampling units; (4) samples which were systematically located had a more favorable size-accuracy ratio than did samples which were randomly located; (5) considerations other than the relative size-accuracy ratios are more important than the ratios in determining the optimum method of sample location; (6) the distribution of land and land-use types was associated in a minor degree with variations in sampling accuracy; and (7) precise determination of the relative advantages of line and area sampling units will require much data concerning time requirements for sampling.

62 pages. \$1.00. MicA54-1752

GEOLOGY

PARTICLE SIZES OF CLAY MINERALS BY SMALL-ANGLE X-RAY SCATTERING

(Publication No. 8598)

Ronald James Arnott, Ph. D.
Columbia University, 1954

A review of the present methods of particle size determination of clay minerals indicates that none are entirely adequate. Electron microscopy has provided the first reliable measure of clay sizes but it gives poor results with montmorillonite and illite. This paper describes an investigation of small-angle x-ray scattering by minute particles as a possible technique in the study of clay minerals. The interpretation used is that of Shull and Roess¹ involving a graphical comparison of experimental scattering curves with theoretical scattering curves. In theory, both the distribution of particle sizes and the shape of the particles should be obtainable, but in practice outside evidence of the shape is required.

Descriptions of the method and of the two-crystal spectrometer used to collect the data are included, as well as the data obtained for two carbon black samples and twenty-eight clay samples. The carbon blacks and most of the clays gave scattering curves from which particle size information could be

extracted. The scattering curves for the halloysites and attapulgites could not be interpreted, probably because of the fibrous or tubular shapes of their particles. Of five purified samples of illite and montmorillonite examined, four gave uninterpretable scattering curves, possibly due to extreme orientation during treatment. No measure of particle thickness could be obtained from the scattering data, but a method of deriving this information from a combination of the scattering data and surface area measurements was investigated.

Because of the paucity of similar data in the literature, it is difficult to verify the particle size information presented here. However, it is believed that the small-angle x-ray scattering technique will fill the need for a relatively simply method of determining average clay sizes.

63 pages. \$1.00. MicA54-1753

1. Shull, C. G. & Roess, L. C.: X-ray scattering at small angles by finely-divided solids. I. General approximate theory and applications — *J. of App. Phys.*, vol. 18, 295-307.

**STRUCTURAL ANALYSIS OF THE NORTHERN
END OF THE TOBACCO ROOT MOUNTAINS,
MADISON COUNTY, MONTANA**

(Publication No. 8777)

James Virgil Barnes, Ph. D.
Indiana University, 1954

An areal geologic study and structural analysis has been made of the northern end of the Tobacco Root Mountains, Madison County, southwestern Montana. Situated near the western margin of the Missouri River drainage basin at the edge of the craton, these rugged, early mature mountains occupy a position near the eastern boundary of the Millard miogeosynclinal belt close to the intersection of this marginal depression with the central Montana trough, essentially representing at the present time, a Tertiary erosion surface which has been folded, faulted and uplifted to present elevations.

This erosion surface truncates 7000 to 8000 feet of Algonkian, Paleozoic and Mesozoic sedimentary and igneous rocks which unconformably overly Archean gneisses and schists of a basement complex characterized by northwest- and northeast-bearing structural lineaments which were influential in the chronological development of Laramide structural trends. Local northwest-bearing structural elements of a stable southeastern structural zone, exemplified by the Carmichael anticline and Carmichael fault, are separated by a northeast-bearing transitional zone, represented by the Spring Basin fault, Perry Canyon anticline and Bone Basin syncline, from the Tobacco Root allocthon, which is the principal unit of the northwestern zone of structure.

An analysis of the Carmichael anticline reveals 14,250 feet of oblique, rotational movement northward along the curved Carmichael fault accompanied by downward tilting toward an intersection with the Spring Basin thrust which has shifted a segment of the northwest-plunging terminus of the structure 10,300 feet northeastward in the transitional zone. A reconstruction of the anticline from the component parts reveals a pre-fault symmetrical fold with an axis which trends N. 45° W. and plunges 10° NW. This fold represents a small unit of a local system of en echelon folds that were truncated by northeast-trending lineaments situated on the flanks of a larger regional structure, herein referred to as the Tobacco Root anticlinorium.

The Tobacco Root allocthon of the northwestern structural zone situated north and northwest of the Tobacco Root fault is represented to the southwest in the Florence Mine terrain by the Porphyry Hill anticline, and to the northeast in the Mayflower Mine terrain by a narrow belt of isoclinal folds. Both terrains are characterized by northwest-trending axes of pre-fault folds which are marked by northwest-trending axial valleys. A physiographic analysis of this terrain and of the transitional zone reveals that northwest-trending stream valleys of pre-Bozeman age have been disrupted and displaced 10 miles northeastward by the Tobacco Root overthrust. The analysis also shows that this northeastward

overthrusting produced a northeast-trending en echelon zone of symmetrical, parallel folds which have been re-exposed, in part, from beneath the Tobacco Root overthrust in the transitional zone of structure. 194 pages. \$2.43. MicA54-1754

**HYDROTHERMAL ALTERATION AND URANIUM
MINERALIZATION IN THE SILICA HILLS
AREA, MARYSVALE DISTRICT, UTAH**

(Publication No. 8618)

Gerald Patrick Brophy, Ph. D.
Columbia University, 1954

Tertiary volcanic rocks in the vicinity of Marysvale, Utah are divided into two major groups - the Bullion Canyon (older) Series, composed mostly of latites and andesites, and the Mount Belknap (younger) Series of rhyolite and rhyolitic tuffs. The Bullion Canyon rocks are intruded by quartz monzonite and granite.

All the volcanic rocks are altered hydrothermally, but the rhyolites show the least effects. Associated with part of the hydrothermal alteration is uranium mineralization, both as vein and disseminated deposits.

Six alteration types are discernable: calcification, zeolitization, alunization, argillitization, sericitization, and silicification. These can be divided into two major periods of alteration: alunitic and argillic. The younger alunitic alteration is associated only with rocks of Bullion Canyon age, and may represent emanations from more basic magma. Argillic alteration is associated with all rock types.

The uranium bearing solutions, rich in fluorine, are later than most of the argillic alteration and sulphides in the Freedom #2 mine. Quartz monzonite, abnormally high in calcium, has proven to be the most favorable host rock, and rhyolite the least.

One new mineral species, a hydrous uranium molybdate named Umohoite, has been described from the Freedom #2 mine.

The deposits, on the basis of the $Pb^{206}U^{238}$ ratio, are found to be $9.8 \times 10^6 \pm 1.2 \times 10^6$ years.

210 pages. \$2.63. MicA54-1755

**A STUDY OF THE NORTHERN BLACK
HILLS TERTIARY PETROGENIC
PROVINCE WITH NOTES ON
THE GEOMORPHOLOGY INVOLVED**

(Publication No. 8515)

Bahngrell Walter Brown, Ph. D.
University of Nebraska, 1954

The Tertiary intrusive rocks of the northern Black Hills are dominantly porphyritic in texture and are preponderantly light gray in color. The rocks are intermediate in composition and fall mostly in the range from phonolite to quartz-monzonite. There are, also, restricted lamprophyres and rhyolites which are quantitatively minor.

Variations in alkali content appear to be more significant than variations in silica, and it is thought that silica variations reflect a cooling environmental situation, but not necessarily crystal fractionation.

The province has been petrographically characterized and defined as an igneous space-time form. A new terminology has been introduced for use in describing that form, and the form has been mapped according to the new principles. The resulting, or "architectonic" map, has been related to post-Cretaceous orogeny and thereby a new light has been cast on certain perplexing problems of the northern Black Hills. The problem of the "Tertiary" and "Pleistocene" "agglomerates" has partly been resolved and harmony has somewhat been restored to an otherwise disharmonious Cenozoic history.

Fundamental lineation has been demonstrated for the intrusives, and this has been related to architectonic symmetry. The lineation and symmetrical arrangements may have deep seated structural implications and the writer has hypothesized the existence of a substrate shear zone separating the two principal Black Hills structural blocks.

It has been concluded that, although the intrusions were multiple, the intrusive events were not widely separated in time and, therefore, can be related to Laramide orogenies as a probable late orogenic stage.

The intrusive history can be inferred from widely scattered observations, but petrology enables us to correlate intrusive structures and reconstruct the essentials of the history. The architectonic concept and the concept of intrusive stratigraphy which have been introduced here have proved helpful and may prove of even more benefit in studies of a more complex nature. 131 pages. \$1.64. MicA54-1756

GEOLOGY OF THE PINE VALLEY MOUNTAINS, UTAH

(Publication No. 8344)

Earl Ferguson Cook, Ph. D.
University of Washington, 1954

The Pine Valley Mountains of southwest Utah lie in a zone which is structurally transitional between the Basin and Range and the Colorado Plateau provinces. The mountains are largely composed of a de-roofed monzonite porphyry laccolith which has an exposed extent of 70 square miles and a maximum remaining thickness of 3,000 feet. The concordant base of the laccolith is exposed or thinly covered by talus for 25 miles.

The decipherable history of the Pine Valley Mountains begins with a long period of marine and continental deposition, with intermittent emergence and erosion, but without folding. Sometime in the late Jurassic or early Cretaceous, the region was moderately warped and Upper Jurassic rocks were beveled by erosion. Geosynclinal or foreland trough sedimentation began in the early Late Cretaceous with the deposition of a basal conglomerate followed by a thick accumulation of shale and sandstone.

Near the close of Montana time the area was uplifted; two folds developed along northeast axes, became overturned toward the east, and possibly broke into thrusts of small displacement. The numerous orogenic pulsations recorded in the thick Cretaceous and Tertiary sediments of central Utah apparently did not affect the Pine Valley Mountains area. The absence of evidence of movement within the Upper Cretaceous rocks and within the overlying Claron formation (the basal part of which may also be of Upper Cretaceous age) closely brackets the main Laramide movement.

After the Laramide folds were planed off by erosion, the quartzite conglomerate and lacustrine limestone of the Claron formation were deposited. Claron deposition was closely followed by an extended series of volcanic eruptions which produced rhyolite and dacite ignimbrites; welded tuff-breccia; andesite, latite, and dacite flows and breccia; mudflow deposits; and minor air-fall tuff and intercalated sediments. Several unconformities within the volcanics, some of them marked by deposits of lacustrine limestone and quartzite gravel, may record either orogenic disturbances or periods of great intrusive folding. Although the Pine Valley laccolith postdates this Early(?) Tertiary volcanic sequence, other intrusions in the area may be older and may have been associated with the earlier folding in the volcanics.

Closely following the formation of the volcanic rocks, the Pine Valley intrusion spread laterally between the Claron formation and the overlying volcanics. The intrusion moved in as a half-crystalline mush in which some gravitative settling of the mafic constituents took place before solidification of the rest magma. A thin zone about 1,200 feet above the base of the laccolith apparently remained partially liquid longer than the rest and suffered the most intense deuteric alteration during final consolidation. A roughly horizontal color banding in the laccolith is believed to be due partly to gravitational crystal fractionation and partly to differential deuteric alteration.

During the Quaternary, deep erosion, stimulated by spasmodic uplift along block faults (accompanied by widespread thin basalt flows), has stripped the cover from the Pine Valley laccolith. Because of its resistance to erosion, the laccolith now stands high above its less resistant sedimentary pedestal.

265 pages. \$3.31. MicA54-1757

REGIONAL PHYSICAL STRATIGRAPHY OF THE TRIASSIC IN A PART OF THE EASTERN CORDILLERA

(Publication No. 8365)

Willard Frank Scott, Ph. D.
University of Washington, 1954

The Triassic strata of the Eastern Cordillera may be divided areally, by the Wasatch Line, into an eastern, shelf, facies and a western, miogeosynclinal, facies. Rock units in the shelf facies are the Moenkopi, Shinarump and Chinle formations aggregating

about 1,000 feet in thickness. The units in the miogeosynclinal facies are the Dinwoody, Woodside, Thaynes and Timothy formations, which together form the Moenkopi group, and the Shinarump and Chinle formations, averaging 4,000 to 6,000 feet.

Isopach-lithofacies studies show an increase in limestones and finer clastics westward which is primarily due to the presence of the marine Thaynes formation.

Thaynes deposition west of the Wasatch Line was miogeosynclinal whereas all other Triassic units indicate deposition on a mildly unstable to stable shelf. Two moderately positive source areas in the region are indicated, one in Montana and Canada, the other in western Colorado.

Two Lower Triassic seas covered parts of the region; one, the Dinwoody Sea, was largely confined to the area west of the Wasatch Line, while the more extensive Thaynes Sea reached eastward to the southeastern Uinta Mountains and the San Rafael Swell.

152 pages. \$1.90. MicA54-1758

THE PETROLOGY OF THE JUDITH MOUNTAINS, FERGUS COUNTY, MONTANA

(Publication No. 8431)

Stewart Raynor Wallace, Ph. D.
University of Michigan, 1953

The Judith Mountains are a group of Tertiary (?) porphyry stocks and related intrusives that have cut and domed a thick series of sedimentary rocks ranging in age from Cambrian to Upper Cretaceous. Quartz monzonite intrusions mark the beginning of irruptive activity and form the major stocks in all parts of the mountains. Later igneous rocks represent two lines of descent: (1) more siliceous types best exemplified by rhyolite, and (2) rocks relatively poor in silica and high in the alkalis represented by syenite, alkali syenite and tinguaitite. The alkali granite porphyry of Judith Peak occurs late in the igneous sequence. It is rich in both silica and the alkalis and is believed to represent a union of the two separate lineages.

A strong but irregular east-west fault divides the mountains into two structural units, each with a distinct assemblage of igneous rocks. The southern unit is characterized by calc-alkaline rocks, the monzonites and the rhyolites. The northern unit is characterized both by alkaline rocks, the syenites, alkali syenites, tinguaites and the alkali granite porphyry, and by calc-alkaline rocks, the monzonites. The northern unit contains only a few small bodies of rhyolite. The general sequence of irruption is monzonitic rocks, rhyolite, syenite, alkali syenite, tinguaitite and alkali granite.

At the time of intrusion the Madison limestone was more deeply buried beneath the surface in the northern part of the mountains than in the area to

the south. The position of the Madison within the crust was important in that it affected the mode of intrusion. Detailed mapping shows large-scale magmatic stoping of the Madison limestone north of the strong east-west fault but not south of it. This suggests that limestone syntaxis has desilicated the magma at depth to yield the silica-poor and silica-deficient alkaline rocks which are restricted to the northern part of the mountains. In the southern part of the mountains where the Madison limestone was not thus stoped, the rocks that follow the early monzonitic intrusions are highly siliceous rocks, the rhyolites. The alkali granite is believed to represent a late siliceous differentiate of the calc-alkaline series, contaminated by alkaline fluids expelled from the cupola area of a tinguaitite magma chamber.

245 pages. \$3.06. MicA54-1759

OSTRACODS OF THE FAMILY HOLLINIDAE FROM THE MIDDLE DEVONIAN FORMATIONS OF MICHIGAN AND ADJACENT AREAS

(Publication No. 8434)

Martin Weiss, Ph. D.
University of Michigan, 1954

The Middle Devonian strata of Michigan and adjacent areas within the Michigan Basin contain many genera and species of ostracods of the family Hollinidae with greatly diversified structures. At many places in the basin, representatives of this family are numerous and well preserved.

In the course of a comprehensive study of the Hollinidae, previously known species were reexamined and hitherto unknown species described.

The Middle Devonian strata, from which the hollinids were obtained, crop out in three distinctly separated areas in the Michigan Basin. These areas are 1, in the northern part of the Southern Peninsula of Michigan, 2, near Silica, Lucas County, Ohio, and 3, in the vicinity of Arkona and Thedford, Ontario, Canada.

Several stratigraphic relationships between the rocks of these areas are indicated by the common occurrence of certain species of hollinids. Thus, the Bell shale, Rockport Quarry limestone, and Ferron Point formation of the northern part of the Southern Peninsula of Michigan are correlated with the Silica formation of northwestern Ohio; and the Arkona shale of southwestern Ontario is correlated with the Ferron Point formation of the northern part of the Southern Peninsula of Michigan as well as with the Silica formation of northwestern Ohio.

Within these areas hollinid ostracods assigned to 61 species and 12 genera were found. Of these 11 species and one genus are new. The new species are as follows: 7 of *Hollinella*, 2 of *Falsipollex*, and one each of *Ctenoloculina* and *Winchellatia*.

162 pages. \$2.03. MicA54-1760

HEALTH SCIENCES

HEALTH SCIENCES, GENERAL

SOYBEAN PRODUCTS AS SUPPLEMENTS TO RICE IN CHINESE DIETS WITH SPECIAL REFERENCE TO THEIR PROTEIN AND CALCIUM CONTENT

(Publication No. 8626)

Yet Oy Chang, Ph. D.
Columbia University, 1954

The value of soybeans and three soybean products used interchangeably in supplementing rice in the Chinese diet have been studied with special reference to their protein and calcium content. The products studied were (1) dried yellow soybeans (Ta tou), cooked, (2) soybean curd (Tou fu), (3) soybeans, fermented (Tou chi), and (4) soybean fermented curd (Tou fu lu). The products were purchased in a Chinese grocery store in New York City. They were then dried and finely ground.

One hundred and thirty-two weanling albino rats, 44-45 grams in weight, were paired according to sex and size and placed on experimental diets for 26 weeks. In all, nine different diets were used, one diet serving as a positive control diet (Diet I) with 18 per cent casein, three diets serving as negative control diets (Diets II, III, and IV) and four diets containing 25 per cent of the soybean products to be studied (Diets V, VI, VII, and VIII) with 5 per cent casein but no calcium. One diet (Diet IX) furnished dried cooked soybeans at a 30 per cent level without casein but with added calcium. Diet II contained 5 per cent casein but no calcium, Diet III 5 per cent casein and adequate calcium, Diet IV no casein but with adequate calcium.

All diets were adequately supplied with vitamins and a salt mixture (with or without calcium) supplied the mineral elements.

The soybeans and soybean products were analyzed for nitrogen and calcium. After 26 weeks on the experimental diets, the animals were chloroformed. femurs removed and analyzed for calcium deposition. Eleven weanling rats were sacrificed and the femurs removed and analyzed for calcium for comparison.

Of all the soybean-product diets studied, the soybean curd diet (Diet VI) was found to be the best for growth and calcification. This diet furnished 23.21 per cent total protein and 0.17 per cent calcium.

The fermented soybean curd diet was found to provide the poorest growth and calcification of all of the soybean products studied. It furnished 19.09 per cent of total protein and only 0.04 per cent of calcium.

The dried cooked soybean diet provided for slightly better growth and calcification than the fermented soybean curd diet. It furnished 19.45 per cent total protein and 0.07 per cent of calcium.

The fermented soybean diet was found to provide

slightly better growth and significantly better calcification than the fermented curd diet. It furnished 17.74 per cent total protein and 0.08 per cent of calcium.

The process of fermentation does not appear to improve the utilization of soybean protein under the conditions of this investigation.

In the negative control diets (Diet II without calcium and Diet III with calcium) where the casein was fed at a 5 per cent level and rice at an 80 per cent level, the animals on Diet III showed better growth, lived longer and were healthier in appearance than those on Diet II, emphasizing the importance of calcium.

In comparing the two diets containing dried cooked soybeans, Diet V with 5 per cent casein and no added calcium, and Diet IX without casein but containing adequate calcium, the growth was found to be about the same, but as would be expected, calcification was much better on Diet IX.

In view of the world shortage of good quality protein, the production and use of soybean curd should be encouraged in all parts of the world where animal proteins are in short supply and the calcium of the diet is low. 67 pages. \$1.00. MicA54-1761

HEALTH SCIENCES, PUBLIC HEALTH

THE PATHOGENICITY AND ANTIGENICITY OF ENTAMOEBA HISTOLYTICA

(Publication No. 8381)

Rhoda Marquita Michaels, Ph. D.
University of Michigan, 1954

A study of the effect of the bacterial flora on the extra-intestinal pathogenicity of *E. histolytica* was undertaken in order to obtain a better understanding of the underlying mechanisms of amoebic penetration, and to use this knowledge for the development of a reproducible experimental disease entity. The effect of systemic cortisone as an enhancing agent was also studied to achieve this purpose. The development of such a model was undertaken in order to study the antigenicity of *histolytica* by means of an active or passive protection test.

The pathogenicity of two strains was studied by the production of hepatic lesions in hamsters. In a series of experiments conducted over a two year interval, it was found that the infectivity and pathogenicity of both strains varied significantly and inconsistently with length of time in culture. A quantitative study of the bacterial flora of strain 202 revealed that the species of numerical predominance (*A. fecalis*)

was undergoing dissociation between the rough and smooth phase. Only the addition of the smooth phase to the inoculum immediately before injection significantly enhanced the infectivity of the complex. The pathogenicity, as measured by lesion weight, was not fully restored. These findings were confirmed when the subcutaneous route of inoculation was used in mice.

The effect of systemic cortisone (i.m.) was studied using several strains of *histolytica*, several routes of inoculation, and three species of animals (rats, mice and hamsters). Cortisone did not enhance the infectivity of two strains, DKB and UC. Subcutaneous titration in mice of 5, 2.5 and 0 mg. of cortisone against inocula containing 25,000 to 75,000 organisms of strains 200, 201, 202 and 201SB (single bacterial associate) resulted in almost 100% infectivity at both levels of cells and 50% infectivity at the lower level of cortisone with all the strains but 201SB (50% and 0%, respectively). Additional studies were made with strain 202. Using 5 mg. of cortisone and 50,000 cells, almost 100% of the animals inoculated i.p. and i.h. became infected. Using inocula containing the same level of cells, a study was made of the effect of various dosage schedules on subcutaneous infectivity in mice.

Studies were conducted on the *in vitro* effect of cortisone on *histolytica* using the 202 strain. When a final concentration of 1 mg. of cortisone was used against an initial inoculum of 10,000 cells, complete destruction of the amoebae resulted. No such effect was noted when a lower concentration of cortisone, or higher initial inoculum of amoebae were used.

Active and passive immunization studies with 202 strain were made in mice. No active immunity was demonstrated. Neutralization resulted using anti-living amoebae serum, anti-lysed amoebae serum and anti-bacterial serum.

The three types of studies indicate that bacteria prepare the way for the invasion of extra-intestinal tissue by *Entamoeba histolytica*.

212 pages. \$2.65. MicA54-1762

EDUCATIONAL ACTIVITIES PERFORMED
BY PERSONNEL IN PUBLIC HEALTH
DEPARTMENTS OF AN AMERICAN
COMMONWEALTH

(Publication No. 8416)

Vaughn Smith, Ph. D.
University of Michigan, 1954

The principal aims of this study were: (1) to identify the educational activities performed by public health workers in their day-to-day jobs; (2) to determine for each of the educational activities, the percentage of participation by each of the personnel categories studied; and (3) to examine the differences in the extent of this participation.

Data were provided by 259 public health workers employed in the state health department and in eight local health departments within the same state. Included were: physicians, nurses, engineers,

sanitarians, laboratory scientists, statisticians, dentists, nutritionists, business management personnel, and secretaries. Personnel categories were established according to type of health department (state or local), professional speciality or job function (medical, nursing, environmental sanitation, and others), and level of responsibility (administrators, consultants, supervisors, or staff). All of the workers in eighteen categories were studied; sampling was not used.

The data were selected from those obtained for the Yale Public Health Personnel Research Project.¹ Individual interviews of workers and group investigation procedures were used to collect the information, and an activity code was used to organize and code it. For this study, items of information pertinent to educational activities were separated from the array of items concerning various kinds of activities in the total job. These selected items were then combined and rearranged to form approximately fifty educational activities which were analyzed.

The specific findings were presented and discussed for the participation of the various personnel categories in educational activities of six types. These were: (1) Utilization of the educational approach in selected activities, (2) Activities in the general health education services of the health department, (3) Activities concerned with selected media of communication, (4) Activities carried on with elementary and secondary schools, (5) Activities carried on with community groups, and (6) Activities concerned with contributing to the professional education of public health personnel.

It was concluded from the over-all results that definable educational activities are an integral part of the total job activities of state and local health department workers. In the extent of participation in particular educational activities, various differences exist between state and local health department personnel, between administrative and staff personnel, and among the professional specialist groups. There were indications that certain undetermined factors are related to extent of participation in these activities. Two possible factors - formal preparation and length of experience in public health - were examined, and the results showed a trend indicating that formal preparation may be a factor associated with greater participation in educational activities.

Some implications of the study were pointed out. One was in the planning of professional education and in-service training to prepare all public health workers for participation in the educational activities which are part of their total jobs.

332 pages. \$4.15. MicA54-1763

1. The Yale Public Health Personnel Research Project was a survey conducted in selected public health agencies in six states, to obtain comprehensive data for use as a base in attempting the solutions of certain problems in public health administration. Impetus came from various groups within the American Public Health Association, and primary financial support came from the Public Health Service, U. S. Department of Health, Education, and Welfare. The writer served on the Yale Project staff and collected data in the Commonwealth described in this study. Permission to draw upon these data for analysis in this study was granted by the project directors.

HISTORY

HISTORY, GENERAL

SENATORIAL PARTICIPATION IN SHAPING CERTAIN UNITED STATES FOREIGN POLICIES, 1921-1941: (being largely a study of The Congressional Record)

(Publication No. 8526)

David Hopwood Mickey, Ph. D.
University of Nebraska, 1954

Adviser: James L. Sellers

Little will remain to be said of a topic once it has been taken up and opened for full debate by the members of the Senate of the United States. This great deliberative body advises concerning, and grants consent to, the roles which this nation plays in international politics. The members of our Senate, as they debated certain issues of foreign policy, 1921 to 1941, provided an interesting spectacle.

Our Senate's rejection of the Treaty of Versailles and the Covenant of the League of Nations precipitated a sort of crushing finality upon the hope that this nation would play the role in international affairs which its physical maturity had forecast. But mental maturity was lagging, and the "catch up" did not arrive until - well, certainly not before that fateful Sunday, December 7, 1941. The challenges of world affairs which followed those votes of 1919 and 1920 brought forth many senatorial responses which have been given the general classification of "isolationism." Many of the finer points of individual contribution have been lost in the shuffle for generalization. These "finer points" are the subject of this effort.

The selection of events or developments around which a study of responses could be made was not, in itself, difficult. Most text books on American History afford ample outline. The issues of Tariff, Allied Debts, Immigration, Naval Disarmament, the World Court, the Paris Peace Pact, and Neutrality offered themselves for academic sacrifice.

The Congressional Record quite automatically became the medium for examination. Most other documentary sources issuing from our Government were arbitrarily excluded. Thus, this review of responses became at the outset a study of the Record. Standards for judgment were sought in contemporary periodical materials and other published accounts. Arbitrary exclusion eliminated use of newspaper sources. Most biographical and autobiographical works were only fleetingly examined after it was found that they did not add greatly to the information which was

sought for the narrowed purpose of this thesis; these, like the more direct contemporary accounts, did add, however, clarification and color.

This student doubts if he has revealed any new and startling evidence. He has sought to pull from the fabulously lengthy debates excerpts of senatorial verbosity which, when further boiled down, can be read and understood at a single sitting - that is, in certain instances. General conclusions which insist that many of our senatorial decisions were tragically obstructionist at the very time when positive foreign policy was needed are largely substantiated.

Our Senators gave expression to nationalistic outburst which was so typical of the world between the two wars. Their collective decisions reflected in many respects the decadence which prevailed throughout much of public opinion in the United States during these two decades. The long flares of colorfully portrayed patriotism and the deep and most worshipful sighs for worn out shibboleths disclosed how intensified had become our own self-satisfaction. Then, as the rest of the world continued to increase the military and economic and racial disciplines, we, as a nation, drifted into our own blind alley.

Not a few of our Senators (and several have been given biographical and descriptive attention in this dissertation) shared the blame for this nation's meager and somewhat negative contribution to the pathetic search which was made for an historic creation of peace. If this work mounts the scale to windy proportion, seven chapters and 633 pages, please remember that thus were many of the members who held chairs in the "world's most exclusive club," the Senate of the United States of America.

737 pages. \$9.22. MicA54-1764

HISTORY, ANCIENT

THE OFFICIUM OF THE URBAN PREFECTURE DURING THE LATER ROMAN EMPIRE

(Publication No. 8411)

William Gurnee Sinnigen, Ph. D.
University of Michigan, 1954

The purpose of this study is 1) to show the urban officium functioning as an integral part of the administration of Rome and Constantinople, the two great metropolitan centers of the Later Empire, and 2) to show the similarities and differences between the

officium of the Urban Prefect and officia of the other important ministers, especially those of the Praetorian Prefects. Such a study is important from the point of view of the administrative history of the period between Diocletian and Justinian, since the existence of the Later Empire depended in so large a measure on the proper functioning of the bureaucracy in all its branches.

The urban officium is to be seen acting in all spheres of metropolitan administration, but especially the legal and financial. The Urban Prefect relied on his officium for the execution of his orders, whether in summoning witnesses to court, keeping the protocol before his tribunal, levying and keeping account of taxes, or managing public services. Especially noteworthy is the use of the illiterati of the officium at Rome as a police force, in conjunction with the guilds and curatores regionum. The Urban Cohorts and vigiles do not seem to have existed after the reign of Constantine.

Several salient features of the organization of the urban officium are noted. The role of the chief of staff, princeps officii, as a spy of the central government should not be overemphasized. As an ex agente in rebus, the princeps of the urban officium, and, by analogy, the princeps of the praetorian officium, cannot have been subordinate to the Master of the Offices at the imperial court. In the urban officium, the post of primiscrinus attained a greater importance than in the praetorian, since the primiscrinus was both an executor - and accountant-in-chief. It is concluded that in the latter capacity he was also given the title numerarius. The department of the censuales was an important feature of the urban officium distinguishing it from the praetorian. The censuales, who originally administered senatorial taxes, seem to have been restricted by the sixth century almost exclusively to archival rather than financial duties. The competition between the Urban Prefecture at Rome and the Praetorian Prefect of Italy is illustrated in the fourth century by the appointment from their respective officia of principes officiorum to certain provinces in Italy from which taxes in kind flowed to both Prefectures. That this right of appointment was exercised in the fifth and sixth centuries only by the Praetorian Prefecture is symptomatic of the decline in importance of the Urban Prefecture at Rome as a branch of the administration.

It is concluded that 1) as in other branches of government, so also in the Urban Prefecture, orderly administration depended to a large extent on the successful manner in which the officium carried out the orders of its prefectural head, 2) that the urban officium, while strikingly similar to its praetorian counterpart, differed markedly from the latter in the organization of its financial departments, and 3) that the urban officium at Rome was gradually weakening in the fifth and sixth centuries, while that at Constantinople was maintaining and even increasing its power.

293 pages. \$3.66. MicA54-1765

A CATALOGUE OF THE CUNEIFORM TABLETS IN THE DAVENPORT PUBLIC MUSEUM

(Publication No. 8491)

John William Snyder, Ph.D.
University of Minnesota, 1954

Adviser: Tom B. Jones

The nine cuneiform economic texts of the Davenport Public Museum which were used for this study can be divided into three groups. Five are Ur III Dynasty, three are from the time of the Larsa Dynasty, and one is from the city of Uruk during Neo-Babylonian times. In each case an autographed copy has been prepared, and this is followed by a transliteration, a translation, and a commentary.

The modus operandi of the commentary has been a biographical examination of all the individuals involved with special reference to instances where they have been engaged in similar transactions. From this the inquiry returns, where possible, to a general statement concerning the matter of the present text and its relationship to other similar cases.

B871, dated Šulgi 42/5 (Drehem), is a statement of the animals expended by dNina-kam and taken in charge by Na-ša₆. A study of all the available texts where Na-ša₆ appears indicates that he was an official in the Drehem cattle park in charge of receipt and disbursal of animals for the period Šulgi 40 to Amar-Sin 1/8.

B873, dated Gimil-Sin 1 (Umma), concerns rent or tribute payment in grain from various individuals. É-gal-e-si, an official involved in the transfer of these payments, was found to have made a specialty of such transactions.

Tablet No. 1, dated Gimil-Sin 2 (Umma), involves the small livestock taken in charge by an official, Urdá-a₁₁.

B870, dated Gimil-Sin 3/11/10 (Umma), is a list of rations paid to nine individuals who were retained as temple couriers or helpers of some type. This text belongs to a large group of similar texts which are characterized by their small size, crowded writing, and similarity of content, and which have generally been described as "messenger texts." The present study has shown that this description requires some qualification in that other occupations are also mentioned, in addition to the fact that they can be shown in part to have been daily occurrences.

B872, dated Ibbi-Sin 2, is a statement concerning the sale of some copper sickles.

B874, B875, and B876 are all from the period of the Larsa dynasty, and all come from in or near that city. B874 furnishes further corroboration for the date-formula for the sixth year of Sin-iddinam of Larsa; B875 relates the sale of a fishing concession; and B876 concerns the sale of a field.

B878, dated Nabonidus 8/4/17 (Uruk), is one of five available tablets through which almost the entire progression of the litigation concerning a contested debt can be traced. B878 is one of two surety obligations involved in this litigation. These five tablets (four of which were available in other publications)

afford an examination from an actual case history of the nature of the surety obligation, the amount of penalty fixed, and the probable outcome of the whole process. 141 pages. \$1.76. MicA54-1766

HISTORY, MODERN

THE ROLE OF THE ARMY ENGINEERS IN THE WESTWARD MOVEMENT IN THE LAKE HURON-MICHIGAN BASIN BEFORE THE CIVIL WAR

(Publication No. 8610)

Henry Charles Borger, Jr., Ph. D.
Columbia University, 1954

The army engineers first became an instrument of federal aid to internal improvements by the General Survey Act of April 30, 1824. The President could order surveys of possible roads and canals and send resulting plans for actual construction to Congress for approval. Although this specific legislation became inactive in the 1830's and no over-all internal improvement program ever materialized, the army engineers, whether from the Corps of Engineers or the Corps of Topographical Engineers, were from that time on connected with roads, canals, harbors, surveys, and other forms of land or water transportation improvements.

In the Lake Huron-Michigan Basin they first built roads that radiated from Detroit, the most famous and influential of which was the Chicago Road, or began others in present Wisconsin. The dependence of many settlers on these roads, the filling in of population and the location of land offices along these routes indicate their influence on the development of the region. Though many roads were that in name only, some rated highly according to the standards of the day. Most affected the location of towns and settlements and served as avenues of trade and travel.

Work on harbor improvements began because lack of natural harbors on the Great Lakes aroused the legislatures and those interested in improving trade and safety on these inland waters to petition Congress. Despite the changing attitudes of various administrations, the engineers did much actual work and also aided localities by providing plans and, at times, equipment. They did considerable during the 1830's but scarcity of appropriations later hampered them. Chicago, Milwaukee, and other cities owed much to these harbor projects. On the other hand, St. Joseph and Michigan City received considerable aid, but neither their geographical situation nor harbor potential merited top rank.

Of the other lake improvements the beginning on the bottleneck of the St. Clair mud flats between Lakes Huron and Erie and the aid and encouragement to the building of the Soo Canal, superintended by a Topographical Engineer, are important.

Beginning in 1841 the engineers made a detailed

survey of the Great Lakes, a project that continues today, and printed navigational charts from the data gathered. Their importance in increasing the safety of life and property on the inland seas was well recognized before the Civil War. The participation of Engineers on the Lighthouse Board from its creation in 1852 further aided navigators in this district and others.

The Engineers also made other surveys, such as the Illinois-Michigan Canal, a few of the railroads and the Michigan-Ohio and Michigan-Wisconsin boundaries, which influenced the westward movement in the Lake Huron-Michigan Basin.

The harbor, channel and lake improvements hastened the development of the more economical and capable propeller and the displacement of the side-wheeler on the lakes. They stimulated the tremendous growth of the lake cities and the phenomenal increase of passenger and commercial trade, which topped \$600,000,000 annually before 1860. All this, including the roads but excepting lighthouse work, received Congressional appropriations between 1824 and 1860 of about \$2,125,000, not much more than the amount spent on the one project of the Delaware breakwater. These non-military projects of one branch of the military before 1838 were under two corps whose total strength was 33 and from then until 1860 under one corps of 36 officers. Seldom, if ever, were a half-dozen army engineers stationed in this region at any one time before the Civil War. Thus, through their guidance and supervision a few with meager appropriations did much for the development of the Huron-Michigan Basin.

287 pages. \$3.59. MicA54-1767

THE STRUGGLE FOR NEUTRALITY: A HISTORY OF THE DIPLOMATIC RELATIONS BETWEEN THE UNITED STATES AND FRANCE, 1790-1801

(Publication No. 8612)

Albert Hall Bowman, Ph.D.
Columbia University, 1954

This work is a study of relations between the United States and France in the period of the French Revolution. It is believed that original source materials of both countries have here been used extensively for the first time and that this fills a need for a unified treatment of the subject based equally on French and American sources. This method, and its inevitable juxtaposition of contrasting points of view, has led to significant revision of accepted interpretations covering the whole period. For that reason, this can appropriately be termed a re-interpretation of Franco-American relations in these years.

When Jefferson left France and Moustier quit America towards the end of 1789, relations between the two countries suffered from long neglect and misunderstanding on both sides of the Atlantic. The outbreak of the wars of the French Revolution in Europe compounded the misunderstandings, and

these were not helped in the United States by the Girondin evangelist Genet, or in France by the monarchist sympathizer Morris. Both were obstacles to the understanding they should have promoted, Genet through frustrated zeal, and Morris through an aristocratic hatred. The overthrow of the international revolutionaries of the Gironde by Robespierist nationalism provided an opportunity for a new attempt at mutual understanding, but Morris repelled the friendly advances of Deforgues and Fauchet's exasperation at the new boldness of the Francophobe Federalists, whom Genet's indiscretions had strengthened, rendered him impotent.

The crisis which England's ruthless maritime policy produced in the winter of 1793-94 should have restored the balance, but the Federalists succeeded in blocking Madison's program for winning commercial reciprocity from Great Britain through economic coercion. Jay's mission to England resulted in a treaty which cast aside America's neutrality and her liberal maritime principles.

Monroe, who had been given the impossible task of allaying French suspicions regarding Jay's purposes, was seriously compromised and saw his real accomplishments undone by French resentment. He was able to temper (with Delacroix's help) the Directory's reaction pending the American elections of 1796, but the Republican failure to capture the presidency ended its hesitations. That French grievances were legitimate was implicitly acknowledged by Hamilton in the mission to France which he proposed and dominated through his followers in Adams' cabinet and in the Senate. Federalist hopes for the mission's failure received unexpected support from the Directorial hostility with which Talleyrand was contending, but the uncomprehending inflexibility of the Americans left little chance for a peaceful settlement. Only Gerry showed the understanding and will for true conciliation, and he has been disparaged ever since for his pains.

If the XYZ affair was not a gigantic hoax perpetrated upon the American people, it nevertheless fulfilled the fondest hopes of the radical Federalists. They used it to inaugurate actual hostilities against France without a declaration of war, and to unleash their own reign of terror against their domestic opposition. Adams, carried along willingly in the Federalist war-mongering, finally rebelled when he realized that his country and his party were being led to ruin, and that he himself was superfluous in the new order. Only then did he take notice of Talleyrand's persistent efforts at conciliation and defy his party's real leadership to send another mission to France. By violating the uncompromising instructions of Adams, these envoys at length negotiated a just and honorable treaty, but while this was being transacted in Paris a more promising development for future Franco-American amity was taking place in America. The Republican victory of 1800 guaranteed an honest search for a fair and impartial American neutrality.

480 pages. \$6.00. MicA54-1768

FRENCH AGRICULTURE: TECHNOLOGY AND ENLIGHTENED REFORM, 1750-1789

(Publication No. 8616)

David John Brandenburg, Ph. D.
Columbia University, 1954

This is a study of the reform movement in French agriculture during the waning of the Enlightenment. Developments in French farming and in French agricultural literature are compared with what was going on in England during the late eighteenth century. The study is based mainly upon an examination of the agricultural literature that appeared in France during the period under consideration.

In view of the land-settlement achieved during the course of the French Revolution and of the fact that the peasants have remained in control of French land ever since, it is now obvious that the late eighteenth century offered the last opportunity for enlightened change in French agriculture "from above." Since this sort of change may be undertaken without consideration for the desires of those whose way of life is to be affected, it can partake of the violent qualities that are called revolutionary. In England there was an agricultural revolution which was actually an agrarian revolution accompanied by some changes in the techniques of farming. In France there was no agrarian revolution and therefore no agricultural revolution; but there were changes, or at least advocated changes, in agricultural techniques.

The presence of these advocated changes brings up the question whether or not there was a revolution in agricultural thought. Again, despite the fact that the agronomes desired to introduce such changes as moldboard plowing and the extension of grass-lands, their tendencies were more in the direction of a "reform" movement, in the strict sense of the word reform, rather than a "revolutionary" attempt to remake French agricultural technology along new and radical lines. They wished, by and large, to render the quality of French farming, within the frame of reference set by the past, more nearly excellent. The intellectuals of the Enlightenment generally have been accused of formulating their theories and recommendations for reform without sufficient attention to the real world that would be affected by their proposed changes; here was at least one group of such intellectuals that definitely used the actualities they were trying to change as their starting point and endeavored to adjust their ideas accordingly. Had the agronomes all committed themselves to the physiocratic view of agricultural reform or to the English view, they would have been remarkable failures. As it was, they were at least theoretically successful. It was almost as though they had been forewarned of the agrarian effects of the French Revolution which were to perpetuate and guarantee the peasants' hold on the land.

The techniques put forward by the agronomes would have increased the per unit yields of French farming through conservative enlightened usages.

But their ideas generally did not tend toward intensive land-exploitation. Their attitude toward rotations was one which if implemented – and it seems to have been – would have preserved soil-fertility, prevented erosion and exhaustion of the soil.

The techniques they advocated seem, then, to have been suited to the needs of a permanent, resident, owner-farmer who would wish that his son and his grandson and his grandson's descendants would prosper on the ancestral soil.

265 pages. \$3.31. MicA54-1769

THE LIFE OF FREDERICK A. P. BARNARD
TO HIS ELECTION AS PRESIDENT OF
COLUMBIA COLLEGE IN 1864

(Publication No. 8631)

William Joseph Chute, Ph.D.
Columbia University, 1951

Frederick Augustus Porter Barnard, American scientist, educator, and university president, was born on May 5, 1809 of English and Dutch ancestry which extended back to the original founders of Massachusetts and New York. Claiming to have been self educated because of the weakness of the educational system of his day, he nevertheless attended the district school of his native town of Sheffield, Massachusetts, the academies of Saratoga, New York and Stockbridge, Massachusetts, and was a student at Yale for four years, being graduated with the class of 1828. After teaching two difficult years at the Hartford Grammar School, during which time he published a revolutionary text in mathematics, he returned for one year as a tutor at Yale.

Although promised a professorship in mathematics should he remain, his growing hereditary deafness caused him to accept a position at the American Asylum for the Deaf and Dumb where he could make a living if he had no ears at all. His work at the Asylum was supplemented by literary activities – writing an occasional poem, and following John Greenleaf Whittier as editor of the *New England Weekly Review* in 1832. With the reorganization of the New York Institute for the Deaf and Dumb in 1832, he was invited to join the faculty at that institution, and he remained on the staff until 1836. During this period he sought to promote and popularize the instruction of the deaf mutes through public demonstration and publication of articles in the leading periodicals of the day.

While in New York, Barnard's interest in science, which can be traced as far back as his infancy, was further stimulated through his study of higher mathematics and the scientific writings of the day. His article on the aurora borealis of November 14, 1837, published in the *American Journal of Arts and Sciences* is a masterpiece of keen observation and vivid description which gained him a small reputation among his colleagues, and helped to determine his future in science.

In 1838 Barnard accepted a professorship of mathematics and natural philosophy at the University

of Alabama, where he won the respect of the community not only for his part in establishing one of the first academic astronomical observatories in the United States, but also for his promotion of teaching science by experimentation and observation, introducing co-education in his classes, his work on the literary periodical *The Southron*, and his keen interest in the problems of the day.

During his sixteen years of service at Tuscaloosa he developed in many ways. In 1854 his interest in the educational problems of the American college was aroused by a political attempt to reorganize the University according to the University of Virginia plan, with its broad elective system in professional training. He offered an alternative plan by which the old system of mental discipline be retained for the first two years, with limited electives during the last two. With tempers hot in Tuscaloosa, he was glad to have the opportunity to transfer to the University of Mississippi late in 1854, where his aggressive temperament won him the presidency two years later.

His attempt to reform the system led to bitter factionalism, which was not unmixed with antagonism of religious sects, and high emotion aroused over sectional interest. His enemies, unable to defeat him on the educational level, attempted to defame his reputation through false stories reflecting on his morality, and finally tried him as being unsound on the slavery issue. His days at Mississippi were unfruitful, save for presenting him with the experience of meeting every possible opposition his later life might raise.

With the outbreak of the Civil War, Barnard accepted the northern side, became the exponent of the conspiracy theory of the war by which he exonerated most of the southerners as being duped by the conspiratorial "fire-eaters." He served in the Coastal Survey until, through the influence of his friends and brother, General John Gross Barnard, he was elected President of Columbia College.

355 pages. \$4.44. MicA54-1770

THE YELLOW RIVER ADMINISTRATION
IN THE CH'ING DYNASTY

(Publication No. 8351)

Chang-Tu Hu, Ph.D.
University of Washington, 1954

One of the major characteristics of a traditional Chinese dynasty was the concentration of power in the hands of the central government, which had as its primary objective the unchallenged control over all important aspects of national life. The task of river control, indispensable to an agricultural country like China, remained throughout Chinese history a matter of paramount importance, for which a special administrative organization was maintained, in one form or another, by all dynasties. Such an organization existed in the Ch'ing dynasty in the form of the Yellow River Administration, for the Yellow River, because of its unruly nature, presented a

more serious problem than any other phase of water work. The necessity for prevention of recurrent floods was, in the Ch'ing dynasty, compounded by the central government's dependence upon the Grand Canal for its bulk of revenue and food supply, inasmuch as an uncontrolled Yellow River would certainly render the Canal unnavigable and disrupt the grain transport system.

Thus, direct control by the central government over river work was one of the prerequisites for the consolidation and preservation of central power, and the degree of effectiveness of the Yellow River administration determined, to a considerable extent, the fortunes of the dynasty itself. The purpose of this study is therefore to show the developmental process of this special river administrative organization, its expansion, bureaucratization and corruption, and its disintegration and abolition. It is believed that a study of this one important part of the central bureaucracy, in view of its intimate connection with the overall bureaucratic system, will help understand the manner in which the Ch'ing government operated as well as the causes which brought about its downfall.

This study is divided into six chapters, preceded by a brief introduction. The first chapter gives a general account of the characteristics of the Hwang Ho and its role in Chinese history. The second chapter describes the Grand Canal and its significance in the power structure of traditional China, leading up to the Ch'ing dynasty when the Canal served as the lifeline over which the central government obtained its major portion of food supply. The purpose of the first two chapters is to present a general background picture, against which the river administration is projected.

The third chapter deals with the organization and expansion of the Yellow River administration from the beginning of the dynasty to approximately the beginning of the 19th century. In order to give a proper historical perspective, a brief summary of the development of river control administration in previous dynasties is given. The fourth chapter attempts to show the function and finance of the river administration, with emphasis on the steady tendency towards formalization of function and increase in expenditure.

The process and results of bureaucratization are discussed in the fifth chapter, and its main theme is the self-defeating nature of the river administration when it became fully bureaucratic. The last chapter analyses the various factors which brought about the disintegration and abolition of the administration, thus completing the cycle which characterized the development of both the administration and the Ch'ing dynasty.

287 pages. \$3.59. MicA54-1771

THE MOVEMENT TOWARD INTERNATIONAL COOPERATION IN FOOD AND AGRICULTURE: BACKGROUND OF THE FAO OF THE UN

(Publication No. 8461)

Frederick William Kohlmeyer, Ph. D.
University of Minnesota, 1954

Examined from a historical perspective the FAO emerges as the culmination of more than fifty years of precedent and experience. A mutual interest in a particular branch of agriculture or a common concern with technical and economic problems had, before 1900, motivated many international gatherings and led to the formation of permanent organizations. The objectives and activities of these pioneer groups presaged the goals and programs of the FAO.

The prolonged agrarian depression and the disabilities of agriculture in an alien economy inspired the concept of an organization for defending the general interests of agriculture (embracing also forestry and fisheries). The non-governmental International Commission of Agriculture formed at Paris in 1889 and the intergovernmental International Institute of Agriculture founded at Rome in 1905 were in many respects the precursors of FAO. Both participated in the Geneva Conference in 1927, where agriculture for the first time was included in high level intergovernmental economic discussions. Both subsequently shared in League activities.

The Institute was most successful in its statistical work and in sponsoring conferences with the aim of initiating intergovernmental action. The ICA congresses, often dominated by political-minded farm leaders, furnished a valuable forum for the discussion of mutual problems and exchange of technical information. Both organizations led a continuous existence until 1948 when the IIA was absorbed by the FAO and the ICA was reorganized as the European Commission of Agriculture and succeeded on a world level by the Federation of Agricultural Producers.

The League of Nations was slow to give attention to farm problems. After 1929 it endorsed commodity agreements as an expedient for overcoming trade stagnation, and helped in shaping the principles governing such agreements, which aimed to stabilize prices at levels remunerative to growers and fair to consumers, the interwar experience with commodity agreements serving as a manual of instruction.

The League also attempted to solve acute agrarian distress through action on a regional level. A myriad of futile conferences during the early 1930's sought to improve trading relations between agrarian Eastern and commercial-industrial Western Europe and among other measures to create an International Agricultural Bank.

The dismaying prevalence of malnutrition in the midst of unmarketable surpluses seemingly defied solution. Little attention had been given either nationally or internationally to the possibility of raising levels of nutrition until S. M. Bruce of Australia proposed the "marriage of health and agriculture

before the League Assembly in 1935. A conscious effort on the part of governments to improve diets, distribute food to the needy, and subsidize the growing of "protective foods" would improve the world's health and ultimately solve the commodity surplus problem. This idea, linking economic with social objectives, marked the beginning of a significant movement toward better nutrition. Bruce and other leaders in the nutrition movement were among the founders of FAO.

The preoccupation with marketing problems, and the League activities in the field of nutrition form the immediate background of FAO and are embodied in its dual central objectives: freedom from hunger for mankind and adequate returns to the farmer.

The final three chapters of this study trace the formation of FAO and its role from the Hot Springs Conference to the present. The FAO structure and working relations with other agencies and groups are briefly discussed. Its search for a suitable program, its role with respect to post-war food shortages and surpluses, and the growth of its technical assistance program are given particular emphasis.

An exhaustive chronology appended to the study portrays the unbelievable quantity and range of international activity in food and agriculture during the past century.

438 pages. \$5.48. MicA54-1772

JUAN DE ZUMÁRRAGA, FIRST BISHOP OF MEXICO

(Publication No. 8387)

(Rev.) Daniel Joseph Mulvihill, Ph. D.
University of Michigan, 1954

The object of this study is to trace the episcopal career of Juan de Zumárraga, Bishop of Mexico from 1527 to 1548. Sixteenth century Mexico is the fundamental period in the history and formation of hispanic and post-hispanic Mexico. The quarter century of Bishop Zumárraga's rule in the diocese of Mexico is a period of important cultural formation, and his career offers a valuable approach to the study of the cultural historical environment in New Spain. The emphasis in this work is placed on the relation of Zumárraga to the Indian population and on his attempts to provide for their absorption into a Christian cultural pattern.

Born in the province of Vizcaya, in the Basque country, late in 1468 or early in 1469, Juan de Zumárraga was educated according to the best standards of the day. He was influenced by the vivid historical sequence in which he had a part. His affiliation with the Franciscan Order brought him into the main stream of the religious reform movement of fifteenth century Spain. His ability carried him to top official posts within the Order prior to his appointment as bishop-elect of Mexico in 1527. This half century of life in Spain is one of the keys to an understanding of his career in the New World and attention is given to the modifying factors which influenced these years.

The direction cultural development was to take in the Indies was discernible before Zumárraga came to New Spain. The basic Indian core was there, and Spanish adaptations had been initiated on the mainland before Juan de Zumárraga landed at Vera Cruz late in 1528. During these first years the positive acceptance by the bishop of his office of Protector of the Indians was responsible for the early advent of the viceregal rule and the end of the disastrous rule of the first audiencia. His dramatic participation in this initial clash of Church and State in mainland America was approved by the Court on his return to Spain in 1532, where he was consecrated. He spent most of his time, until his return in 1534 to the New World, seeking to provide for the spiritual and physical needs of his diocese from the resources of the homeland.

The formal organization of the church was then undertaken. In carrying out this arduous task his first care was for the Indian portion of his flock. He played a decisive role in the pioneer period of the mission work on the mainland. He co-ordinated the efforts of the first groups, and the positive results of the period owe a great deal to his realism and tact, and to his understanding of the problems of the friars.

He did everything in his power to set on foot a lasting program for the integration of the Indian peoples into a new society. He worked steadily towards this goal by establishing schools, founding hospitals and taking an interest in the economic well-being of the native population. His claim to a first place among the founders of Mexican culture is further insured by the fact that he is the first to suggest the formation of a university for the country. His early training in Spain, his interest in the best writing of the day, led him to be one of the first bibliophiles of America. It was this interest in learning, but more particularly his concern for the instruction of the Indians, which caused him to bring the first press to America; it was but fitting that he should edit the first book printed by that press.

Attention is given to the iconoclastic charges leveled against Bishop Zumárraga, and the evidence does not support the accusations customarily accepted as the truth. There is lacking sufficient grounds also to support the indictment of the bishop as a harsh and sadistic inquisitor. The new material relevant to the case of Don Carlos Mendoza Chichimecatecotl, Indian chief of Texcoco, is evaluated and enters into the above conclusion. This study of Juan de Zumárraga reveals him to be one of the main figures in the first phase of the colonial history of Mexico. He was thoroughly convinced of the capabilities of the Indian peoples, and envisaged and implemented a moderate program of integration for them. Unfortunately in certain details, especially educationally, this course of action was not carried much further than his own generation.

330 pages. \$4.13. MicA54-1773

THE REGULATION OF COMMODITY CURRENCY IN COLONIAL VIRGINIA

(Publication No. 8798)

Donald Bowie Scheick, Ph. D.
Indiana University, 1954

Using Hening's *Statutes* as a basic source, this study is an analysis of the role played by tobacco currency in the colonial history of Virginia. Throughout the colonial experience of Virginia the General Assembly persistently tried to regulate legislatively the tobacco trade and thereby manage tobacco both as a commodity and as the colony's primary medium of exchange. With no technical knowledge regarding the economic theories inherent in the present-day concept of a managed economy, these early Virginia legislators instituted many management techniques which today stand in good repute among contemporary devotees of the philosophy of managed economy.

Basically, their major objectives, through the instrumentality of legislation, were (1) to decrease the quantity of tobacco produced, (2) to improve the quality of the tobacco, (3) to improve their credit in England as a result of a smaller quantity and better quality, and (4) to devise a circulating medium which would best serve their monetary needs, since specie remained scarce in the colony during its entire colonial experience.

Among the many currently accepted control devices used by the colonial Virginians were crop limitation and crop quotas, price fixing, credit controls, marketing controls, crop destruction, and crop diversification. In fact, toward the end of the colonial era, through the instrumentality of the famous 1730 tobacco act, the tobacco trade had become so regulated that every phase of the trade was in some way subject to controls.

Despite all efforts at control high tobacco prices were never maintained, and the volume of production consistently increased. Only after a century and a quarter of experimentation did the Virginians achieve a reasonably standardized commodity. Not until 1730 did they establish a system whereby tobacco satisfactorily served as a medium of exchange.

The mediocre success of colonial Virginia's management efforts was due to many factors beyond its control. Virginia planters themselves continuously complained about the tobacco trade but constantly circumvented the laws designed to improve it. Nature too upset the operation of the laws, producing great crops when often least needed and at other times devastating the colony when least expected. Furthermore, the tobacco-producing colonies, beset by the same tobacco problems, systematically outmaneuvered each other, in an attempt to profit by the mistakes of their competitors. More fundamental to the question of control was the fact that the tobacco trade was not a local but a world problem, and thus could not be solved by local legislation. Kings, customs agents, merchants, shippers, and hundreds of others representing extensive ethnic and geographical differences were involved in

the trade, and consistently played havoc with Virginia's legislative efforts.

This study is neither a financial history of Virginia, nor a history of tobacco in that colony. In order, however, to avoid any literary sterility that might develop from the analysis and presentation of laws only, the author has tried to recapture enough of the color and atmosphere of colonial Virginia so that the story of tobacco as currency can be seen in its proper historical perspective.

337 pages. \$4.21. MicA54-1774

ANACHARSIS CLOOTS AND FRENCH COSMOPOLITANISM: THE DEATH OF AN IDEA

(Publication No. 8375)

John Christopher Stevens, Ph. D.
University of Arkansas, 1954

The eighteenth century in Europe was a cosmopolitan age. It was a period when the prevailing attitude among those who thought and wrote transcended national limits. The *philosophes* often regarded mankind as a unit and all men as brothers. There were evidences of nationalism, to be sure, but the age of modern nationalism did not arrive until the era of the Revolution. From that period nationalism emerged as a dominant force in world affairs.

The purpose of this study has been to investigate the cosmopolitan spirit of the eighteenth century, particularly in France, and especially of the early years of the French Revolution, and to try to determine at what point and how it gave way to the spirit of nationalism which came out of the Revolution. In the course of the investigation study focussed upon the life of Anacharsis Cloots, a Prussian subject who became a naturalized Frenchman, a member of the National Convention, president of the Jacobins, and a prolific writer of the Revolutionary period, because he was the chief spokesman of the brand of cosmopolitanism much publicized during the early Revolution. Cloots advocated a universal republic with headquarters in Paris and a parliament of man. He wished to do away with all national barriers and organize the whole world along the departmental lines of Revolutionary France. It was not the primary purpose of this study to develop another biography of Cloots, but rather to trace the rise and fall of cosmopolitanism. This cosmopolitanism, however, was so closely tied in with his activities during the Revolution that a sketch of his life seemed desirable.

The method followed in studying the subject was: (1) to sample the writings of representative eighteenth century thinkers, as Voltaire, Rousseau, Condorcet, Mably, Diderot, Fenelon, the Abbe de Saint-Pierre, and others in order to form an estimate of the climate of opinion during the pre-Revolutionary period; (2) to trace in considerable detail the life of Cloots, a cosmopolitan; (3) to study books (especially those of Cloots), newspapers, and other records of the first five years of the Revolution in order to trace the movement of the cosmopolitan spirit during that

period; and (4) to arrive at some conclusions in keeping with the evidence. Accounts of proceedings of the French legislative bodies, from the National Assembly through the first year and a half of the Convention were carefully checked for expressions of cosmopolitanism and nationalism. Sessions of the Jacobins came in for scrutiny. Works by recognized scholars of the French Revolution were consulted for their contributions to the subject under investigation.

On the basis of the evidence the conclusion was drawn that the old pre-Revolutionary eighteenth century cosmopolitanism faded away during the early years of the Revolution, not only because of such factors as reverses on the fields of battle and suspicion of foreigners on account of actual and alleged espionage activities, but also because of the extreme tactics used by advocates of cosmopolitanism, notably Cloots, in espousing a policy of propagandism and conquest ostensibly to spread principles of freedom beyond the borders of France. When cosmopolitanism

left the realm of literature and became an instrument of political action, it ceased to be the old pre-Revolutionary cosmopolitanism and became imperialism. Cloots himself incurred the enmity of Robespierre because his propagandism was creating enmity on the part of other nations toward France, and because his fight against religion, conducted in the name of cosmopolitanism (since he considered religion a divisive force among men), made France the object of suspicion. And since the rising spirit of nationalism dictated that anything contrary to the national interest of France could not be tolerated, cosmopolitanism and the anti-religious movement had to be exterminated. Cloots was accused of disloyalty and espionage, and was guillotined with the Hebertists in March, 1794. With him much of the old cosmopolitan spirit disappeared. The new spirit of nationalism became predominant.

328 pages. \$4.10. MicA54-1775

JOURNALISM

FREEDOM OF THE PRESS IN TEXAS: A COMPARATIVE STUDY OF STATE LEGAL CONTROLS ON MASS NEWS MEDIA

(Publication No. 8450)

Norris Garland Davis, Ph.D.
University of Minnesota, 1954

Co-Chairmen: William Anderson
Ralph D. Casey

Mass communications media in the United States, with few exceptions, have been free in the sense of the Blackstone definition - no previous restraint. Modern theories of freedom, however, recognize the importance of restraints following publication as well as those preceding. It is generally recognized that certain such restraints are allowable, but they must be carefully applied so that the interests of the individual and of society, as served by freedom of the press, are carefully balanced. Such restraints have been thoroughly studied by writers setting forth general rules for all the states, but no previous study has carefully analyzed the peculiarities of these restraints in individual states.

The first purpose of this study, then, was to analyze in full detail the restraints on freedom of the press in Texas. To make the study more meaningful, a similar study of the laws of New York was made; and the laws of the two states were compared.

The particular areas studied and compared include civil and criminal libel, contempt of court (including direct contempt and trial by publicity), invasion of privacy, access to records and proceedings, miscellaneous restrictions, legal advertising, and the role of newsmen in the development of the law. Enough important differences between the two states

were found to indicate a definite need for newsmen to be familiar with the laws of their own state.

The second purpose of the study was to determine whether such differences appeared to have any significant relationship to the stages of development in the two states. The differences found are too few and too varied for scientific generalization. Nevertheless, there are rather clear indications of developments in New York which have preceded and which to some extent may predict developments in Texas.

No such indications are found in the long-established areas of the law such as civil and criminal libel and contempt. Differences in these areas appear to be primarily the result of accidental combinations of events.

In the areas of newer laws, the differences appear to be significant. New York has protected the privacy of the individual for half a century. Texas still refuses to recognize the right. New York judges and lawyers have been much more concerned with sensational news reports as constituting trial by publicity than has been the case in Texas. New York also has been more active in fighting subversion, in restricting books, in protecting newspapers against false information and newsmen against attack, and in unfair competition litigations.

It appears only logical to assume that Texas will eventually have to solve many of these same problems, and that her solutions will be somewhat similar to those of New York.

The third purpose of the study was to attempt some determination of whether legislatures or the courts are more important in the development of laws pertaining to the press. Indications on this point are entirely inadequate to show a leading role for either agency. Both have added to the growth of

the law; both have added their bit to the peculiarities of the law in each of the states.

Despite the differences found, it appears clear that the development of the law generally has been favorable to freedom of the press in these two states.

The established areas of restrictions have been ever more carefully and clearly defined. Legislatures and courts have moved slowly and often reluctantly toward new restrictions.

575 pages. \$7.19. MicA54-1776

LANGUAGE AND LITERATURE

LANGUAGE AND LITERATURE, GENERAL

FADRIQUE FURIÓ CERIOL, POLITICAL THINKER OF SIXTEENTH CENTURY SPAIN

(Publication No. 8606)

Donald William Bleznick, Ph. D.
Columbia University, 1954

This study endeavors to evaluate the thought of one of the outstanding humanist reformers of the Spanish Renaissance, Fadrique Furió Ceriol (1527-1592). As a scholar of energetic purpose and indomitable will, he assumed a noteworthy role in the salient currents of ideas in his time, particularly in the realm of political theory.

The core of Furió's political thought is found in his *El concejo i consejeros del príncipe* (Antwerp, 1559), which constitutes one of the most important political treatises of Spain in the sixteenth and seventeenth centuries. He, like his contemporaries, relied upon the wisdom of the classical Greco-Roman tradition and that of the medieval times. While he dealt with the age-old political problems such as the aim of the state; the different types of government; the nature and duties of the prince; the relationship between ruler and vassals; and the importance of harmony and unity in the state; his chief purpose in writing was to discuss the subject of the prince's councils and councilors. In his epoch, Spain's need for competent advisers and smooth-functioning councils constituted a source of constant concern in view of the increasingly complicated and complex task of governing the extended territories of the Empire.

It appears that Furió was the first Spanish writer of the Renaissance to have devoted an entire book to the role of the *consejero* in the governmental processes. It is evident that his treatise exerted influence on later writers. The esteem in which *El concejo* was held is manifested in the wide circulation it achieved immediately following its original publication. In developing his theory of the *concejo*, Furió combined the ideas of the past with his personal observations derived from extensive travels all over Europe and frequent contact with important contemporary figures. He assigned a paramount role to the king's councilor. Accordingly, he professed the prince (Philip II) information concerning the mental and physical characteristics of man so that he might be enabled to make wise selections.

The suggested examination of a candidate's qualifications adhered to strictly objective lines. His proposals for the reorganization of councils showed brilliance in thought and presentation. His delimitation of the powers of each of the seven councils was designed to eliminate unsound practices in the governmental processes. The prince, working in close cooperation with his efficient councilors, would constantly strive to promote the welfare of his subjects.

Furió actively participated in the affairs of the Low Countries where he spent some time in the service of Philip II. Distressed by the revolt in that part of the Spanish Empire, he sought to establish peace and harmony under terms which would guarantee fair consideration of the Netherlands' grievances.

Erasmian inspiration undoubtedly led Furió to enter into the controversy over the translation of the Bible into the vernacular. His *Bononia* (Basel, 1556), which contains his defense of such translations, brought severe attacks from theologians at Louvain — such translations had been banned in the Index of the Spanish General-Inquisitor, Valdés, in 1551 — and, it was only through the protection of Charles V and Philip II that he escaped unharmed. He urged the re-evaluation of Christian ideals by using the early Christian ways as a guide.

A final aspect of Furió's thought is encountered in his rhetorical treatise, *Institutionum rhetoricarum* (Louvain, 1554). In this work he adhered to the then current acceptance of style as the all-important aim of rhetoric.

Fadrique Furió Ceriol was one of the most original and stimulating thinkers of sixteenth century Spain who received the praise of his contemporaries and later critics.

209 pages. \$2.61. MicA54-1777

DIDACTIC LITERATURE IN AMERICA: 1825-1850

(Publication No. 8779)

Fred Allen Briggs, Ph. D.
Indiana University, 1954

The didactic book, designed to spread an idea and usually financed through philanthropy, has an ancient place in religious literature, but the movement for the publication and circulation of such volumes gained new strength in America about 1825 through

the formation of various non-denominational and denominational publishing organizations. The detailed histories of five (the American Tract Society, the American Sunday School Union, the American Baptist Publication Society, the Massachusetts Sabbath School Union, and the Methodist Book Concern) furnish typical information about publishing activities.

Books printed by didactic publishers were distributed largely through the agency of the Sunday school. A history of the Sunday school movement in America shows its developing attitude toward printed matter and the growth and importance of the Sunday school library as a circulation agency for didactic literature. The libraries were numerous, widespread, and free; during the twenty-five years studied, the type of books became more liberal and less stodgy; but chief disadvantages of the didactic books of the age, and of the libraries which distributed them, were poor selection and administration, amateur authorship, and a fear of using literary devices which would produce realism and interest. The study of the history and organization of the Sunday school library in this thesis is more nearly complete than any similar treatment now in print.

The American didactic book, with its distributing agency, the Sunday school library, was not only a potent force during the crucial twenty-five years between 1825 and 1850, but it exerted a significant influence upon American life and culture in succeeding years. Between a quarter and a third of both the titles and the volumes printed belong to the class. Individual titles had more copies printed than was usual in American books. These volumes, distributed with missionary zeal and with highest religious approval, were read more widely than their mere numbers would indicate. The reading of didactic works — in areas where there was little other printed matter to read and by people who were limited in their reading material by their religious beliefs — helped to create the reading public upon which both the public library and universal public education depend. The Sunday school, its library, and the didactic books used by both contributed heavily to the completion, organization, and techniques of both the library and the school. In more general areas of American culture, the effect of Sunday school books is also to be seen. Some of the readers were directly affected as they attempted to pattern their lives, their ideas, and even their writing after their reading; another group, having encountered the worst features of didactic literature, rebelled against the precepts stated there and enlisted in the army of general nihilism typical of the twentieth century. Other, and less tangible, effects may occur in various areas of American philosophy. Both the good and bad of didactic books have left their imprint on American life of today.

220 pages. \$2.75. MicA54-1778

THE RELATION OF T. S. ELIOT TO THE CHRISTIAN TRADITION

(Publication No. 8780)

Hazel Emma Butz, Ph. D.
Indiana University, 1954

In view of a wide divergence of critical opinion concerning the relationship of Thomas Stearns Eliot to the Christian tradition, a thorough investigation of the subject is needful and timely. The work of many critics is helpful in establishing the nature of that relationship, but no study heretofore has attempted an exclusive and complete treatment of the subject.

Eliot began his religious development in a Unitarian home that respected tradition, but Unitarianism obviously did not satisfy him. During Eliot's eight years of study at Harvard University, his search for ultimate values, enforced by a growing skepticism of modernist values, inclined him toward an older tradition of classicism and humanism. Many influences contributed to the strengthening of this inclination. He read the French symbolists, who protested against materialism, naturalism, and certain trends in romanticism. He greatly admired Irving Babbitt, who hated romanticism and insisted upon the humanistic ideals of control, order, and discipline. He began a life-long study and admiration of Dante, whose philosophical and theological ideas, as well as artistic attainments, impressed him. He wrote his doctoral dissertation on Bradley's monistic philosophy. Bradley insisted upon value in the world of nature. Eliot listened to lectures by Henri Bergson, who opposed the notion that science alone can tell us about reality.

As early as 1916 Eliot denounced the liberal Anglican theology, and by 1923 he was clearly moving in the direction of Anglo-Catholicism. In 1927 he repudiated humanism insofar as it posed as a substitute for religion, and he confessed conversion to the Anglo-Catholic faith. From then on, Anglo-Catholicism has directed his views on a broadening field of interests and activities — political, sociological, economic, educational, religious, and literary.

The significance and scope of Eliot's Anglo-Catholic perspective appear in the religious currents which led to his conversion, namely, anti-liberalism and anti-rationalism; in his analysis of the Church as a present-day institution; and in his thoughts on the relationship of Christianity to society and to literature.

Eliot's poetry and drama parallel his prose statements with regard to his religious development. The early poems reveal a sensitive soul struggling through the hell of skepticism and futility. That Eliot would find in the Christian tradition the values he sought is anticipated in *The Waste Land*, yes, even in *Prufrock*. From *Ash Wednesday* through the *Four Quartets* and from *The Rock* through *The Cocktail Party* is reflected Eliot's acceptance of the values offered by Anglo-Catholicism.

Both the early and the later work show the influence of the Catholic tradition. For imagery and

phrasing Eliot is heavily indebted to Catholic sources: Catholic theologians, Catholic mystics, Catholic liturgy and the Bible, and Dante. Furthermore, Eliot uses the Catholic concepts of Sin and Grace creatively, in modern vernacular, to analyze individual and social ills and to suggest a remedy for them.

The facts and interpretations presented in the dissertation discourage the view that Eliot has been insincerely and precariously posing as an Anglo-Catholic. Rather, they reveal Eliot's relationship to the Christian tradition as thoroughgoing and Catholic.

380 pages. \$4.75. MicA54-1779

**DRYDEN'S ADAPTATIONS FROM MILTON,
SHAKESPEARE, AND CHAUCER**

(Publication No. 8462)

James Vernon Lill, Ph. D.
University of Minnesota, 1954

Major Adviser: Samuel H. Monk

John Dryden's adaptations from his predecessors in English poetry are one manifestation of the cultural nationalism that partly characterizes the literature of the Restoration. Dryden's constant endeavor was to define standards, by means of which English poetry might move forward with the other arts and sciences, and to compose in the enlightened mode of these standards. His adaptations from Milton, Shakespeare, and Chaucer illustrate this endeavor. He adapts Milton's *Paradise Lost* as an opera, he imitates Shakespeare's *Antony and Cleopatra* and adapts his *Troilus and Cressida* as formal tragedies, and he translates Chaucer's *Nun's Priest's Tale*, *Wife of Bath's Tale*, and *Knight's Tale* into the Restoration idiom. Each of these works had excellences that attracted Dryden, but each also had shortcomings in the light of Restoration standards, and Dryden's application of Restoration rules to his originals tended to destroy the very qualities that attracted him most.

The thesis attempts to show Dryden's aims, methods, and achievements in adapting, as well as he could, these various works of his predecessors to the taste of his age and to his own critical tenets. Each of Dryden's performances involves a selection from and an interpretation of the source work, and the degree to which the alterations can be explained by Dryden's critical pronouncements demonstrates the consistency of his performances with his theories. His aim is not only to adapt past excellence to contemporary needs and taste but also to fortify the English poetic tradition by the only means available to him – critical praise and judicious adaptation. Dryden's general praises of his predecessors are eloquent and unrestrained, but his criticisms of certain of their techniques are often specious; and where his tributes emphasize the qualities of abundance and variety in his forebears, his critical reservations militate against the preservation of these qualities. The Restoration rules for poetry provide

the objective criteria for excellence by which Dryden judges his predecessors and to which he conforms his adaptations, but the rules are inimical to the particular strengths of Milton, Shakespeare, and Chaucer, and, as a result, the characteristic excellences of Dryden's models are absent from his unified, moral, and decorous adaptations.

Dryden's achievements in his adaptations are relatively limited. He does not seek to duplicate or equal his predecessors and he attains many positive Restoration virtues. He achieves many structural and somewhat fewer purely poetic excellences, but they remain largely isolated as he misses the individual quality through which the originals have survived. He substitutes wit for sublimity in his adaptation from Milton, modish sophistication for colloquial charm and surface embellishment for profound humanity in his translations of Chaucer, and morality for indecorum in his imitation and adaptation of Shakespeare; and in all of these compositions he generalizes the meaning, conventionalizes the emotions, and regularizes the verse. Only in *All for Love* does Dryden introduce a new and relevant interpretation of his material that is sustained throughout the work and provide us with a performance that has substantial individual merit. In all of his adaptations, Dryden makes sweeping and positive changes in structure, scope, characterization, and meaning, and he levels the various poetic effects of his forebears to the decorous Restoration mode. He applies contemporary values to all of his modernizations and he supports them with contemporary allusions, but he remains aloof from his materials and works from without rather than from within. Dryden attacks his materials with vigor, purposefulness, and skill, but with little subtlety or feeling, and everywhere he puts the stamp of his mind and his age on works that are congenial to neither.

284 pages. \$3.55. MicA54-1780

**THE TRANSCENDENTAL ESTHETICS IN
AMERICA: ESSAYS ON EMERSON,
GREENOUGH, THOREAU, AND WHITMAN**

(Publication No. 8357)

Charles Reid Metzger, Ph. D.
University of Washington, 1954

The subject of this thesis is the esthetics, i.e. the ideas on art and beauty, advanced by Emerson, Greenough, Thoreau, and Whitman. This subject includes not only the bare exposition of these esthetic ideas but also some discussion of the relationships between them, particularly relationships of likeness and difference, of inclusion and exclusion, and of differences, finally, in emphasis. These ideas and relationships between them have been approached in the first place by way of a relatively exhaustive examination of key terms such as *art* and *beauty*, of their definitions (when they are defined), and of their uses in the journals and other prose writings of these four writers. In the second place these ideas

and their relationships have been approached by way of the definitions and uses of normally non-esthetic terms such as nature, science, the One, which appear to share and to contribute to the meanings of the more strictly esthetic terms by virtue of their close association in context.

With regard to Emerson in particular this thesis includes discussion of conceptions suggested by his uses of such terms as transcendentalist, Nature, beauty, unity, art, architecture, and Genius. With respect to Greenough it includes discussion of ideas suggested by his uses of such terms as aesthetics, architecture, beauty, character, completeness, Oneness, nature, function, and genius. With regard to Thoreau this study includes discussion of such conceptions as are suggested by his uses of terms like mystic, transcendentalist, natural philosopher, economy, salvation, poetry, nature, architecture, beauty, and art. This study deals in a similar manner with ideas suggested by Whitman's uses of such terms as Democracy, nature, soul, candor, identity, prudence, esthetic, art, beauty, architecture, theology, culture, and the Divine Literatus.¹

I have concluded from this investigation of terms that the esthetic ideas of Emerson, Greenough, Thoreau, and Whitman are sufficiently alike to warrant joint consideration. I have concluded that the esthetics of these four writers are alike in deriving from their tenure of similar protestant religious convictions, and in being essentially protestant, individualistic, anti-proscriptive, and anti-neoclassical in disposition. I have concluded that the differences in the esthetic ideas of these four writers are largely differences in emphasis and are traceable in part to such differences in conviction as are suggested by their religious backgrounds, i.e. traceable to the differences, for example, between the influences of Emerson's Unitarian religious background and Whitman's Pietist religious background upon their otherwise closely related protestant esthetic ideas.

I have concluded finally that these men were no mean estheticians – that collectively they explored most of the important areas of esthetic speculation including consideration of such central matters as the nature and functions of art and of beauty – considered variously at the levels of the human mind, of the divine mind, at the level of phenomenal nature, at the level of the art object, at the level of the artist (of his life), and at the levels of society and mankind.

I have endeavored to suggest in the closing section of this thesis that what I have chosen to call the transcendental esthetics is not a thing entirely of the past. I have suggested that the emergence of a transcendental esthetics in America marked the beginning of an esthetic tradition that is still very much alive – a tradition pervading much of modern architectural theory – a tradition which is yet so much a part of the present climate of literary opinion that its operation as tradition is not always recognized as such. 408 pages. \$5.10. MicA54-1781

1. The listing of terms here is representative rather than exhaustive.

T'AO TSUNG-I AND HIS CHO KENG LU

(Publication No. 8358)

Frederick Wade Mote, Ph. D.
University of Washington, 1954

T'ao Tsung-i was a recluse scholar and writer who lived ca 1320-1401, i.e. through the last five decades of the Yüan dynasty and the first three of the Ming. While the great collectanea Shuo Fu compiled by him is a familiar work, his other writings have remained less well known. T'ao's Cho Keng Lu, a random collection of heterogeneous notes and sketches compiled over a period of years and published first in 1366, is a source of great value for literary, political, economic and social history of the late Yüan period. This study is intended to introduce T'ao, to show that Cho Keng Lu is a work of importance, and to facilitate the understanding and use of the work by scholars.

This study first attempts to reconstruct T'ao's life, bringing together all the data available in T'ao's own writings, in his known biographies, and in the writings of his contemporaries and of later Chinese literary figures. With all of these materials it has none the less been impossible to solve even some of the basic questions of his life – the precise dates of his birth and death have not been determined, and the question of whether or not T'ao served as an official in the Ming period remains unclear, although it seems probable that if he held office at all, it was merely as a minor local educational official for a brief period very late in his life.

T'ao is seen as an unorthodox man whose thought and way of life display independence of mind and a remarkably broad interest in many subjects not dealt with by his learned contemporaries in their writings. These characteristics display themselves in the content and character of Cho Keng Lu, and while they tend to depreciate its worth by traditional standards, it makes the book of special interest to the modern student of Chinese history.

T'ao's recluse way of life is discussed in relation to the background of the times. His learning, thought, and scholarly interests are briefly reviewed. Several of his poems are translated and commented upon in order to shed further light on his way of life and his attitudes.

T'ao's entire literary output is briefly surveyed. The bulk of the remaining portion of this paper, however, concerns Cho Keng Lu. T'ao's method of writing it are discussed and the old legend that he wrote it originally on leaves plucked from trees in idle moments of rest from agricultural labors is shown to be implausible and is rejected. The various editions of the work are discussed. A final section deals with the form and character of the work, its place in the classification of Chinese literature, and its content. An index of subject matter in nine major divisions and numerous sub-divisions is presented, along with some critical and explanatory comment.

An appendix contains translations of a group of

16 short stories in *Cho Keng Lu*, presented as examples of the brief literary *hsiao-shuo* for which it is noted. In connection with these translations the place of T'ao's stories in the development of the literary short-story is also briefly discussed. A second appendix consists of a photo-reprint of the table of contents of a good late-Ming edition of the work, numbered to correspond to the numbers used in citing the various items in *Cho Keng Lu* in the text of this paper and in the index to subject matter.

This study is not primarily concerned with literary history or literary criticism. It attempts to show that T'ao Tsung-i was an unusual person, and that because of his personal qualities and the age in which he lived, his works, particularly *Cho Keng Lu*, record much valuable information not to be found in other works. And although its place in Chinese literature is also discussed, *Cho Keng Lu* is treated here primarily as a source book and not as belles-lettres. 236 pages. \$2.95. MicA54-1782

**THE RETURN OF THE NATIVE:
A STUDY IN THE GENESIS AND
DEVELOPMENT OF A NOVEL**

(Publication No. 8393)

John Paterson, Ph.D.
University of Michigan, 1954

The purpose of this investigation is to record the history of the making of a novel, Thomas Hardy's *The Return of the Native*. Its primary sources are 1) the holograph manuscript now in the possession of the University College Library, Dublin, Ireland; 2) the serial edition in twelve numbers, *Belgravia*, *An Illustrated London Magazine*, January through December, 1878; 3) the first edition of 1878; 4) the Uniform Edition of 1895 and 5) the Wessex Edition of 1912. It seeks, by examining the changes made in the manuscript and in the variant editions, to identify the lines along which the author's creative imagination proceeded. More specifically, it seeks to examine the novel in its strictly material development, considerations of technique and style being deferred.

The focus is on the manuscript itself, the first four of the dissertations' six chapters purposing to describe and analyze its contents. The major finding of this section is that the novel originally derives from a basic situation altogether different from that which ultimately obtains. Under the original conception, Thomasin, as Mrs. Yeobright's "daughter" and Clym's "sister," is projected as the heroine of a drama of seduction with Eustacia, a white witch-figure, as her antagonist. At an early stage, however, the novel abandons this situation and assumes a new direction, Eustacia Vye undergoing, in the process, a radical transformation from witch to tragic heroine. The transition is otherwise an apparently easy one, the *dramatis personae* passing almost intact from the one situation to the other. The subsequent development of the novel is tentative, episodic, experimental, the author evidently proceeding less

according to a pre-established plan than according to the dictates of impulse. In the chapters that compose Book Fourth, the figure of Mrs. Yeobright undergoes an unpremeditated expansion, eliciting in her late emergence a sympathy not predictable on the basis of her early emergence.

The fifth chapter, having established that the serial text is in substantial agreement with the text of the manuscript, undertakes to examine the considerable alterations made for the first edition. The principal disclosure here is that the first edition expresses, for the first time in the history of the novel, the sexual connotation of the Wildeve-Eustacia affair. Otherwise, the first edition seeks to complete trends in revision already inaugurated at the manuscript stage of composition, the image of Eustacia Vye receiving the author's special attention. The sixth and last chapter records the revisions - decreasing now in volume - made for the Uniform Edition of 1895 and the Wessex Edition of 1912. The release of the novel's sexual content is continued. The figure of Eustacia Vye receives entirely new dimensions, however, her classical origins and associations becoming for the first time essentials of her portrait.

In addition to citing the data of the novel's material development, the dissertation permits two broad general conclusions: 1) that the character of Hardy's creative process, despite the rigidity suggested by the final artistic result, is essentially impulsive and unpremeditated, and 2) that in spite of the restoration he is able to effect in the printed phases of the novel's history, the narrow moral censorship of the day must be said to have exerted a fundamental and permanent influence on the novel in its final form.

245 pages. \$3.06. MicA54-1783

**THE ORIENTATION OF NICOLAS BERDYAEV:
HIS RELATION TO JACOB BOEHME, FYODOR
DOSTOYEVSKY, FRIEDRICH NIETZSCHE,
AND HENRIK IBSEN**

(Publication No. 8799)

James Gail Sheldon, Ph.D.
Indiana University, 1954

The writers named exerted major influence upon Berdyaev. This dissertation attempts by "close" reading of relevant works to define and demonstrate that influence, and to indicate Berdyaev's dialogical reaction and his creative response. In each case Berdyaev's interest is shown to lie in the disclosure of the existential insights of these writers. The analysis depends upon consultation of the Russian text of Berdyaev's works.

Chapter I outlines a specific method of analysis which is intended to be adequate and fruitful when applied to any of the problems of Berdyaev's relationships to his sources. This method is an adaptation of certain of the techniques developed by students of Comparative Literature, but with careful attention

to the existential realities of Berdyaev's own modes of thought.

Chapter II provides a survey of the entire complex of relationships, of which a small group are examined in the dissertation proper. Berdyaev's attitudes towards certain major figures in Russian literature and thought, towards certain patristic, scholastic, and theological writers, and towards German Idealism, are briefly characterized.

Chapter III examines carefully and in detail the salient points where Berdyaev has adapted notions derived in part or altogether from Boehme. These include the symbols of the Ungrund (and Berdyaev's idea of meonic freedom), the microcosm, and the androgyn. There is also a discussion of apophatic theology and gnosis. In all these matters some consideration is given to the historical development of such notions.

Chapter IV is devoted to the exposition of Berdyaev's indebtedness to Dostoyevsky. Dostoyevsky and Boehme are the most important influences upon Berdyaev. By a close reading of Dostoyevsky's short story, "The Dream of a Ridiculous Man," his novel, Memoirs from Underground, and the Legend of the Grand Inquisitor in The Brothers Karamazov, and by constant exposition and comparison of Berdyaev's interpretation of these artistic works, the dimensions of the relationship are revealed.

Chapter V treats of Berdyaev's critique of Nietzsche. This relationship illustrates with great clarity the ambivalence and the dialogical quality of Berdyaev's attitude to his sources. Berdyaev interprets Nietzsche's revolt against a decadent humanism and a bourgeois Christianity primarily as a religious revolt in the name of an authentic spiritual life. This chapter attempts to show how such an interpretation associates Nietzsche with Dostoyevsky, Kierkegaard, and Ibsen, and what use Berdyaev makes of the valid insights of Nietzsche, as well as what reservations he has towards Nietzsche's methods and goals.

Chapter VI presents Berdyaev's appreciation for the art and the wisdom of Ibsen, together with illustrations of the application of that wisdom in the dramas and in a wider context. Special attention is given to Peer Gynt as a tragedy of individualism and to Brand as a tragedy of the ethics of law. In shorter sections, other dramas are interpreted in the light of Berdyaev's philosophical principles, and for the reciprocal light the dramas throw on those principles.

The dissertation concludes with five appendices dealing with relevant subsidiary matters. The most important and the most generally useful of these is Appendix E: Towards a Critical Bibliography of Nikolaj Aleksandrovich Berdyaev, which is offered to students of Berdyaev's life and thought as a significant advance over all existing bibliographical aids.

298 pages. \$3.73. MicA54-1784

LANGUAGE AND LITERATURE, MODERN

DANTE GABRIEL ROSSETTI'S THE HOUSE OF LIFE: A STUDY OF ITS ITALIAN BACKGROUND

(Publication No. 8614)

Evelyn Mae Boyd, Ph.D.
Columbia University, 1954

Following the scheme for the critical analysis of poetry suggested by Dante in the second treatise of the Convito, a work known to Rossetti, the present study re-examines his sonnet sequence, The House of Life, first against the background of poetry which he translated from the early Italian: the Vita Nuova, sonnets, and canzoni of Dante, poetry by his predecessors, and by his contemporaries; and second against Michelangelo's sonnets, which Rossetti admired greatly and which in the 1870's he prepared to translate. Analysis of the sonnets of The House of Life in their literal, their allegorical, and their mystical senses reveals close correspondences to the poetry of these early Italians especially in the use of love conventions, Platonism, and iconography.

Among the love conventions found in the poetry of Dante's predecessors - Guido Guinicelli, Jacopo da Lentino, Giacomino Pugliesi, for example - and in that of his contemporaries, Guido Cavalcanti and Cino da Pistoia, as well as in Dante's own poetry, are praise of the lady's beauty through comparison with gems, flowers, stars, and waters; laudation of the lady's modesty, goodness, and virtue; the acknowledgement of the lady as the embodiment of heavenly love. All these ideas have an important place in The House of Life. Mention is made especially of the similarity of The House of Life to the Vita Nuova in general structure and in the poet's response to love, to the donna angelicata, and to the lady's death.

Rhetorical resemblances familiar also in the work of the early Italian poets are present in The House of Life: the address to the lady, dialogue, apostrophe, allegorized narrative, and elaborate analyses of the effects of love.

While Platonism or Neoplatonism is common to most of the thirteenth-century and fourteenth-century poets, it is Michelangelo who seems to have been the chief inspiration of Rossetti's idealistic philosophy. Many of Rossetti's sonnets express basic ideas very like those expressed by Michelangelo: the symbolic meaning of nature; man's reason for existence; his duty upon earth; the destiny of his soul; the revelation of divine love.

The iconography familiar to both the early Italian poets and to Michelangelo is abundantly used in The House of Life. Numerous emblems of the Blessed Virgin aid in portraying the beloved; cloud, wind, and storm suggest doubt and despair; streams, fountains, vegetation, and the light of the sun graphically symbolize love and happiness. Icons and emblems with strong anagogic content appear singly or fused, as in the use of birds

against the full landscape. To heighten vividness of comparison Rossetti employs scenes from human life, from classical story, and from the literature and legend of the Middle Ages. His iconography resembles that of the early Italians not only in its pictorial forms but in its psychological and emotional purposes.

Rossetti wrote within the literary framework which bounded and shaped the poetry of the earlier Italian poets and of such later ones as Michelangelo, Benivieni, and Poliziano. Although he accepted their poetic boundaries he was no mere imitator of their poems. His direct borrowings are few though many of the sonnets reflect common ideas and forms of expression. By recognition of this background the sonnets which puzzled and sometimes repelled their original English readers are not only clarified but a truer appreciation of their genuine poetic beauty is achieved.

264 pages. \$3.30. MicA54-1786

**BRYANT: THE MIDDLE YEARS; A STUDY
IN CULTURAL FELLOWSHIP**

(Publication No. 8621)

William Cullen Bryant II, Ph. D.
Columbia University, 1954

William Cullen Bryant (1794-1878) is remembered chiefly as a journalist and a poet. For fifty-two years he edited the *New York Evening Post*; seventy years separated the composition of his first and last poems. The image persists today of a patriarch whose austere serenity affirms James Russell Lowell's characterization of him as a "silent iceberg" standing in "supreme ice-olation." But his contemporaries knew Bryant as a vigorous leader in the principal cultural organizations and enterprises of his day.

Bryant was an influential critic before Poe or Emerson wrote. He was an early interpreter in the United States of European literature. He was a journalist whose politics were no more interesting to many of his readers than his constant expression of social humanism. He was a force in the development of the American theatre. And he exerted a direct esthetic influence upon, and gave continued support to, the painters and sculptors of two generations. It is Bryant's activity in these cultural areas that has had least attention from his biographers. His part in organizing the Sketch Club they have noted, but not his presidency of the American Art Union. His reluctance to write a theatre prologue is recorded, but not his chairmanship of the prize committees that chose two of the most popular starring vehicles ever provided to American actors - *Metamora* for Edwin Forrest and *The Lion of the West* for James Hackett. His first biographer dismissed the bulk of Bryant's literary reviews with the comment, "Of these articles the interest now has wholly passed away," and no collection or study of this criticism has yet been made.

From his election to the "Bread and Cheese

Lunch Club" in 1825 through his participation in founding the Sketch Club in 1829, the Century Club in 1847 and the Metropolitan Museum of Art in 1870, Bryant was closely associated with the artists and authors of America. His critical articles in the *New York Review* and the *United States Review*, his lectures on poetry at the New York Athenaeum, his essays in *The Talisman* and the *American Landscape Annual*, his lectures as a professor of the National Academy of Design, his addresses as president of the American Art Union and the American Copyright Club, his discussions of literature and art in the *Evening Post*, gave his voice cumulative force in the development of public taste. In the 1840's, his efforts in behalf of American writers to secure an international copyright law and his share in projecting a notable series of cheap books which popularized the writings of Margaret Fuller, Hawthorne, Melville, Poe, Simms, Bayard Taylor and many others gave significant encouragement to these American writers who were producing a literature of lasting importance.

This study undertakes to develop, from a complex of unpublished manuscripts and uncollected writings in print, the basis for an understanding of Bryant's influence on the culture of his time. The quarter century 1825-1850 is chosen as representing his full maturity, before his apotheosis as a classic American author. A list of reviews, essays, tales and eulogies written by Bryant before 1850 contains over ninety entries, some forty of which have not been credited to him by his biographers. Hundreds of unpublished letters provide fresh information about his opinions, associations and travels. The records of the New York Athenaeum, the Sketch Club, the National Academy of Design and the American Art Union record in depth the work of this versatile man of letters, who acted as a powerful catalyst upon the creativity of his fellows.

276 pages. \$3.45. MicA54-1787

**JOAN MARAGALL: CATALONIAN POET
(1860-1911)**

(Publication No. 8624)

Rogelio Alberto Casas, Ph. D.
Columbia University, 1954

The purpose of this dissertation is to study the life and poetry of Joan Maragall, one of the outstanding figures in the modern Renaissance of Catalan letters.

In the Introduction the author has endeavored to synthesize the following elements which are directly related to the poetry and biography of the Catalan poet: (1), the character of Catalonia and its people; (2), the evolution of the Catalan language and literature through Maragall's time; (3), the place of Catalan literature amidst correlative regional movements in the European literary field of the nineteenth century and (4), the literary and artistic environment of the period embracing Maragall's poetical production (1880-1911). In Chapter II, the

life of the poet is related with additional biographical data unpublished heretofore. Chapter III is dedicated to a discussion of Maragall's complete literary production with special stress on those works which bear a direct relationship to his poetry. A critical analysis of Maragall's poetry is the subject treated in Chapter IV. The themes of his original poetry are reviewed as well as his translations and adaptations from German, French and Greek poets. A study of the esthetic ideology of Maragall and the stylistic devices in his poetry completes this chapter. The last chapter is devoted to an evaluation of Maragall's place in literature, his literary influences, critics' comments on his poetry and to an appreciation of his worth and originality. A complete bibliography of Maragall's works has been placed at the end of this study. Nature is the strongest stimulus of Maragall's life and the central theme in his poetry. About this theme revolve all others in his poetical orbit. Maragall's conception of the world is based on a somewhat primitive intuition of the mysteries around him. He tended toward the ecstatic vision which he skilfully enveloped in a very suggestive, though plain, imagery. His is a sensuous lyricism ever warm with life and joyous feeling. Not a philosopher, he did not care to reason about nature but rather he received his spiritual message by meditative contemplation which resulted often in true spontaneity, natural sincerity and purity of expression: the three qualities that he demanded in his esthetic ideology.

An "eclectic" temperament such as Maragall's defies classification. Despite the "classical manner" imputed to him, he is closer to the Romantic tenets by virtue of his childlike expression of the environment, his free acceptance of the suggestions from the natural world and his constant opposition of heart against reason. He is a "modernist" however by virtue of his metrical freedom and eclecticism, though more concerned with substance and rhythm than with exotic vocabulary. He avoided constantly any rhetorical superfluity or effectism.

Maragall represents not only the link with the literary movements of the "fin-de-siècle" period - he is an able translator of Nietzsche and a critic of Ibsen - but also the bridge in Catalan literature between the archeological romanticism of the Floral Games' poetry and the humanistic tendencies of the contemporary period. To the initial efforts of Verdaguer and Guimerà, the immediate predecessors of Maragall, the latter brings to Catalan poetry a new expression both in form and content.

During Maragall's time the Catalan vernacular becomes a full-fledged member of the Romance languages group. Furthermore, Maragall reaffirms the value of Catalan literature as a cultural force in the Romance literary field which had such illustrious predecessors as Ramon Lull and Ausiàs March.

Despite the direct influence on the Catalan people exerted through his journalistic efforts, Maragall was all his life essentially a poet. It was as a poet that he became, during the last decade of his life, the prophet and spiritual guide of Catalonia. A law of all-embracing love and a high moral standard

pervade his verses reflecting a genuine example of a noble life and the deep consciousness of the transcendence of his mission during a time of noted political and social turbulence.

390 pages. \$4.88. MicA54-1788

CHRISTOPH MARTIN WIELAND AND THE
LEGACY OF GREECE: ASPECTS OF HIS
RELATION TO GREEK CULTURE

(Publication No. 8632)

William Harrington Clark, Jr., Ph.D.
Columbia University, 1954

The dissertation presents a critical account of Wieland's extended commentary on Greek culture, with the special intention of displaying his conception of its worth as a civilizing and educative force. To obtain broad coverage of Wieland's voluminous works, translations, and correspondence, all available pertinent titles listed in Seuffert's *Prolegomena zu einer Wieland-Ausgabe* were consulted.

Although Wieland presented, in his mature work, a reasonably objective picture of Greek life, this objectivity was expressed chiefly in his criticism of over-idealization of the Greeks rather than in close attention to detail. The impression of objectivity he gives varies with his artistic purpose and he often weakens it by intentionally drawing parallels with currents and problems of his own day. Yet it is true that for Wieland Greek culture was a habitual, perhaps a necessary frame of reference for the presentation of his essential concerns. His Greeks are symbols of mankind at large, not simply eighteenth-century men and women in ancient costume.

The Greeks, Wieland said, would always remain our teachers, especially in the arts. But it was a mistake to think of them, at any time in their history, as being absolutely exemplary. Civilization and personal excellence were among them, as among all men, things achieved by exceptional genius or exceptional application. The Greeks had indeed achieved great things, but we must not attempt to imitate them. We must strive to be as great in our own way as they were in theirs. Each age has its own peculiar excellence.

The development of Wieland's attitude towards Greek culture proceeds dialectically through successive cycles of enthusiasm, disillusion, and synthesis. This process is followed in the first three chapters of the dissertation, which cover the years from Wieland's birth in 1733 until his move to Weimar in 1772 and give in considerable detail an account of his acquisition of information about the Greeks and the development of his special interests.

At first (to 1756) the Greek tradition supplied him learned and poetic apparatus, while Plato furnished him a metaphysical and ethical ideal. Eventually he rejected the excessive idealism (*Schwärmerei*) of his youth, though he retained a life-long admiration for the figure of Socrates; important in the moderation of his enthusiasm for Plato was the picture of Socrates given by Xenophon. For a brief

period (1757-1760) Wieland appeared to be strongly influenced by Winckelmann in his approach to the Greeks. This is demonstrated by many echoes of Winckelmann in Wieland's lectures to his pupils in Zurich. In a third period (1760-1772) Wieland attempted more and more to view the Greeks realistically, although he still idealized the elements of urbanity and grace.

In dealing with the last stage of Wieland's literary activity (1772-1813), the presentation concentrates on his mature answer to three main questions: What were the Greeks really like in history? - In what way is the artistic achievement of the Greeks exemplary? - What peculiarly Greek moral teachings are worth following? Wieland answered that although Greek civilization was impressive and knowledge of it was indispensable, Greek private and public life was on the whole a warning example rather than an object for emulation; similarly that while the Greeks' supreme achievement was in the arts, it was the ideal of excellence rather than "imitation of the ancients" which modern artists must follow; and finally that the humanitarian ideals of continual self-development and active love for mankind, exemplified in figures of a later time than the "classical" age of Greece (Aristippus, Apollonius of Tyana) were valid guides for moral behavior in the present.

264 pages. \$3.30. MicA54-1789

**ÉTUDE DE LA FEMME DANS LA LITTÉRATURE
EXISTENTIELLE FRANÇAISE: JEAN-PAUL
SARTRE ET SIMONE DE BEAUVOIR**

(Publication No. 8473)

Helene Nahas, Ph. D.
University of Minnesota, 1954

In the Western World literature has been perennially and closely linked to Love and Passion. Woman has almost always appeared in connection with her dealings with her male companions. The myth of Love and Woman has, traditionally, followed a parallel set of lines: one of them is defined by the code of medieval chivalry and embodied in the literary figures of Tristan and Isolde, the other one has developed into what became, later, the myth of Don Juan, stressing the sensuous, fleeting, and at times bawdy pleasures of love. Trends in contemporary literature have pointed to a broadening of the subject matter covered in fiction. Not only will fiction include the treatment of the innumerable variations of the above mentioned fountain-head themes, but it will interest itself in topics previously reserved to philosophers, psychologists, essayists. This literary current has found one of its best expressions in the works of the existentialist philosopher-writers of what has been called "the Paris School": Jean-Paul Sartre and Simone de Beauvoir.

They encompass in their novels and their plays a vision of "human condition", of "man's fate". The relationships between the sexes leave the foreground of the scene to become a mere portion of the whole: human mind at grips with the problems of the world.

We shall no longer read about Nana, Eugénie Grandet, Madame Bovary, Carmen, but about The Blood of others, The Age of Reason, The Roads to Freedom. The experiences previously reserved to men are increasingly shared by women, as they face together the preoccupations of a troubled era. Women appear no longer as embodying various aspects of "Woman" or "Femininity". They are considered as human beings; their two dimensions are freedom and "situation", not "womanhood" or sex. Like men, they are "homo", not "mulier" as opposed to "vir".

The woman of existentialist literature is, primarily, a human being, situated in her time and strongly marked by contemporary environment, and placed before the fundamental choice of all those who have to "exist". She will be defined by her failure or her success in choosing her own life. The existentialist author sees in his female character a conscience that faces a double task: first in relationship to itself, it must attempt the coincidence of the for-self with the in-self, within the contingences of time, location, traditional tasks; secondly, in its relationship to others it must attempt to overcome the fundamental attitude of "alienation" which separates one conscience from all others. These enterprises lead to two sets of achievements which might be variously combined: freedom and communion; immanence and solitude.

We have organized the study of woman to cover the various "situations" in which she exercises these fundamental tasks which are her attempts to attain "authentic existence". These situations are the traditional ones: the young girl and her approach to life and love; the couple and its successful attainment of union by vanquishing the "alterity" of consciences, or its relapse into alienation and solitude; woman in her family and married life; the deteriorations and the perversions of human relationships into eroticism, inversion, sadism etc... .

Having thus covered the forms of the "projects" into which women have been concretely engaged, we have concluded by an evaluation of her place in existentialist literature: she stands, not as WOMAN, or the "Other", but as a human conscience whose authentic existence is challenged by the same problems that all men must face; therefore, within a given situation - family, time, culture - she may drift into the passiveness of the "object", the submissiveness of the immanent conscience; or, on the other hand, she may emerge as a free, transcendent "subject".

225 pages. \$2.81. MicA54-1790

**GABRIEL MIRÓ (1879-1930): A THEMATIC
ANALYSIS OF THE SECULAR WORKS**

(Publication No. 8404)

Henry Charles Schwartz, Ph. D.
University of Michigan, 1954

This dissertation is motivated by a discontent with the present state of Miró studies, especially

insofar as thematic aspects of his work are concerned. Its chief purpose has been to determine and analyze his leading recurrent motives, proceeding by means of illustration in the form of pertinent quoted passages.

Part I (Introductory) includes: 1) a biographical introduction, summarizing and interpreting the events of Miró's life as gathered from all available published sources; 2) a discussion of Miró's place in Spanish literary history, with particular reference to the Generation of 1898 and the Modernists; a résumé of critical appraisals; and an analysis of the features of literary Impressionism revealed by Miró.

Under the remaining headings of the study we have brought together, in juxtaposition and for purposes of comparison, exemplification, and drawing of conclusions, representative elements of Miró's literary and spiritual temario. In Part II (Religious and Philosophical Aspects) are considered: 1) Miró's personal religious feelings and attitude toward the Church, as deducible from his literary production. This discloses a "beneficent illusionism," or cherishing of all ideals and illusions, religious or other, which operate as positive forces for good; this attitude co-exists, sometimes paradoxically, with an ironical skepticism, evidence of which is also shown. The major portion of this section is given over to an investigation of Miró's esthetic interest in the Church: in liturgical celebrations, religious imagery and costumbrismo; and of his association of the liturgy with culinary customs and with outward Nature. 2) Miró's ethical application of religious doctrine is traced from his emphasis on Reverence for Life and brotherly love. His intellectual pessimism appears in conflict with the optimism of his emotional disposition. A note of anti-positivism is found prominent, explicit in his pitting of conservative traditionalism against progressive liberalism. His conception of time and memory is set forth: the function of memory in his artistic creation, and the importance in it of evocative stimuli; his confrontation of the ephemerality of Man with the eternity of outward Nature; his tendency to live in the past and to re-capture the recent past of childhood and adolescence. There follows an investigation of Miró's conception and portrayal of death and his interest in the macabre; Part II closes with a note on his concept of reality in relation to his "estética del chasco."

Part III (The Feeling for Nature) embraces: 1) a brief historical synopsis of modern appreciation of the landscape, followed by consideration of its role and prominence in the work of Miró; 2) extensive analysis of the Impressionistic activity of sensory perception in Miró's literary style in its interpretation of natural phenomena. Under 3) "The Theme of the Return to Nature and of the Ideal Goodness of Man in Nature," a short historical review of this subject is presented, followed by examination of the theme as it recurs in Miró, showing his belief in primitive virtues and in the beneficent influence of contact with beautiful Nature; Miró's own

unsatisfied longing to return to Nature is found sublimated in his artistic creation.

Part IV (The Animate and the Inanimate) comprises a study of 1) character types in Miró and the manner of their depiction; 2) Miró's presentation of the animal world; and 3) the conspicuous role of the inanimate in his work.

The Appendixes feature indexes: a) of writers, painters, and musicians alluded to or quoted by Miró; b) of Spanish place names in Miró; and c) of his writings in chronological order.

The Bibliography brings up to date the list of Miró references not included in previously-published bibliographies of Guerrero and Caravia.

344 pages. \$4.30. MicA54-1791

RATIONALISM AND IRRATIONALISM IN LICHTENBERG AS SEEN IN HIS ATTITUDE TOWARD NATIONAL AND RACIAL PROBLEMS

(Publication No. 8364)

Egon Schwarz, Ph. D.
University of Washington, 1954

Georg Christoph Lichtenberg, the famous physicist, satirist, and aphoristician of the second half of the eighteenth century, expressed his observations and feelings about the various nationalities with which he had contact in a multiplicity of remarks scattered throughout his works and letters. A systematic investigation of these attitudes is not only of significance for the scholarship revolving around the figure of Lichtenberg but also sheds new light on his position within eighteenth-century Germany from a source to which hitherto little attention has been paid. For close scrutiny reveals a fixed pattern underlying the vast and apparently chaotic galaxy of Lichtenberg's utterances in which an attitude is expressed toward the countries and peoples of Europe. Seemingly, Lichtenberg oscillated aimlessly from rational to emotional, from prejudiced to fair-minded moods in his judgments of national groups and foreign peoples. And yet a firm determination to bring these disparate, contrasting, and often incompatible attitudes under the ordering influence and final control of reason becomes evident.

This struggle manifests itself in almost every phase considered in the present study. Lichtenberg regarded France as the traditional rival of Germany on the one hand, and the country which alone possessed the savoir vivre, the graceful mastery of life which his fellow-countrymen were lacking; he had to make up his mind with respect to the French Revolution in which many of the rationalistic tenets became politically victorious but which was equally destructive in its excesses; French science seemed superficial and whimsical to the German scholar but made such admirable progress in the fields of chemistry and physics. Lichtenberg was drawn to England, where he spent the most important months of his life, with the passionate love of a man for the country of his choice, his spiritual fatherland. And

yet it was his problem, his task as a rationalist, to preserve his objectivity toward the land of his admiration, and to distinguish between its right and wrong as elsewhere in life. A similar conflict is noticeable in Lichtenberg's relationship with his native country. He loved Germany and had great ambitions for it, but at the same time he was dissatisfied with the irrational revolt taking place in its spiritual life, and particularly with its nationalistic manifestations. His feelings toward the Jews and the Dutch were generally hostile, but his reasoned fairness forced him to overcome his prejudice in connection with scientific and philosophical questions, and, above all, with individuals. Italy, finally, was the country which he longed to visit as an embodiment of classical antiquity, a storehouse of art and architecture, and the place where modern physics had made such important advances – and perhaps also as a sunny winter climate. Lichtenberg never carried out this plan, and no conflicts clouded the faithful benevolence he felt. But the whole relationship shows the degree of friendliness and internationalism of which Lichtenberg was capable under favorable circumstances.

In summary, it may be said that Lichtenberg, although frequently assailed by his emotionality, his superstitions, prejudices, and preconceptions, was able to maintain his agitated mental life in balance, and by conscious effort, he succeeded in controlling his many psychic and intellectual currents by means of his reason. This struggle as well as the victory are evident in Lichtenberg's attitude toward the nations of his day. Consequently, Lichtenberg must be regarded as a participant in the movement of enlightenment, but an enlightenment in one of the last phases of its historical effectiveness in which much of the irrationalism of future generations announces itself through unmistakable symptoms.

196 pages. \$2.45. MicA54-1792

THE CULTURAL THOUGHT OF KARL EMIL FRANZOS

(Publication No. 8425)

Richard Montgomery Thurber, Ph. D.
University of Michigan, 1954

The purpose of this study is to investigate and evaluate the cultural thought of Karl Emil Franzos (1848-1904) in regard to Eastern Europe. Franzos, who was born in Galicia of Jewish parents, was a journalist, magazine editor, literary scholar, and writer of fiction. Though largely forgotten today by the German reading public and mentioned only briefly in a few histories of German literature, Franzos was nevertheless well-known internationally during his lifetime. As a writer on Eastern Europe, for which he coined the term *Halbasien*, he aroused both admiration and hostility. As an editor, he helped several young and unknown authors launch their careers. As a literary scholar, he stimulated interest in one of Germany's most talented dramatists through his edition of the works of Georg Büchner.

Finally, as a writer of fiction he contributed several works of merit to German literature.

After a sketch of the background of Eastern Europe to orient the reader, the main events in and influences upon Franzos' life are discussed to supplement brief treatments from other sources and to account for some of the author's later cultural views. Following the biography, a discussion and evaluation of Franzos' works in book form are given to acquaint the reader with some of the most important aspects of his literary activity. Finally, Franzos' cultural thought is presented and evaluated in the light of modern cultural anthropology. The material for the biography was obtained from scholarly writings, from the author's own account, and from his manuscripts deposited in the Wiener Stadtbibliothek. Though Franzos' novels and short stories dealing with Jewish village life as well as his manuscripts provided some information, the bulk of the material pertaining to his cultural thought was obtained from his six-volume series of essays and sketches entitled *Halbasien*.

The investigation of Franzos' life and background shows that as a result of being born to and raised by non-Hasidic parents who cherished the ideals of the Enlightenment and admired German culture in particular, the author naturally displayed the same intellectual preferences in his cultural writings. His cultural thought falls into three main parts: (1) an evaluation of the various cultural units in Eastern Europe on the basis of the status accorded women, in which evaluation he used Western European middle-class views as a standard; (2) a discussion of the status of the Jews within these cultural units, and an analysis of the possibility of their eventual assimilation; (3) a plea for the wider diffusion of Western civilization in the Eastern area through German culture to raise the area's cultural level and to rid it thus of anti-Semitism.

From the investigation it was concluded (1) that Franzos employed a standard for measuring culture that is not regarded seriously as the sole criterion by modern cultural anthropologists; (2) that he oversimplified the problem of assimilation by failing to examine thoroughly the philosophy of Hasidic and non-Hasidic Judaism, though he argued that Judaism is thoroughly compatible with Christianity; and (3) that as a result of his unquestioning acceptance of the principles of the Enlightenment, an acceptance modified slightly by Hegel's philosophy of culture, Franzos' cultural thought was largely outmoded even before his death. Franzos' importance as a cultural philosopher lies rather in having employed his literary talents to call attention to a backward area of Europe.

242 pages. \$3.03. MicA54-1793

A REREADING OF KEATS'S ODES:
THE INTRINSIC APPROACH IN
LITERARY CRITICISM

(Publication No. 8436)

Lester Marvin Wolfson, Ph. D.
University of Michigan, 1954

The purpose of this paper is to read Keats's six major odes – "To Autumn," "Ode to Psyche," "Ode on Melancholy," "Ode on Indolence," "Ode to a Nightingale," and "Ode on a Grecian Urn" – in the light of a given critical position. The problem is to offer a set of valid judgments which will be part of the never-ending attempt to appropriate fully the meaning of poems generally given a very high place in English literature.

In Chapter I, the Introduction, intrinsic criticism is defined as a method of arriving at the meaning of a literary work of art by analysis of its component features: in a poem, these features include metaphor; metrics; phonetic values such as rhyme, alliteration, and assonance; and the prose idea which underlies the work. Each of these components is discussed. It is contended that the ultimate worth of a poem is partially dependent upon the validity that the underlying prose idea has for the human norm as conceived by traditional, absolutist Western culture.

Each of Chapters II through VII is given to one of the six odes, and is prefaced by a copy of the ode to be analyzed in that chapter. In preparation for the analysis of sound-values which follow, rhyme schemes, line numbers, and major metrical patterns are indicated. Before each of the original readings offered in this paper, a brief summary of previous major critical statement on the ode under discussion

is included. After the readings, at the end of each chapter a generalized critical comment is presented which sums up the values of the given ode. Chapter VIII, "An Essay on Keats's Odes," offers a final evaluation of the six odes as a group.

The results of the readings add to, confirm, and in some cases modify previous critical judgments. "To Autumn" is interpreted as having more life-value than most commentators have accorded it. The "Ode on Melancholy" is considered to evoke an ambivalent response which does not allow a confident single interpretation. The "Ode to Psyche," though not held the best of the six, is judged to be first among the odes in unity of mood and soundness of underlying idea. The generally accepted conclusion that the "Ode on Indolence" is the least of the major odes is confirmed by discovery of its many deficiencies in imagination, metrics, diction, and theme. The "Ode to a Nightingale" is judged the most impassioned of the six, the most sumptuously sensuous, and next to the "Ode on a Grecian Urn," the richest in prose idea. The "Ode on a Grecian Urn" is considered the best of the odes, for its unique combination of all the felicities which are peculiarly Keatsian – brilliant adaptation of sound to sense, delight in art, nature, and love, embodiment of the truth conferred by intuitive insight into the procession of human life at its highest points, yet all suffused with the sober sadness that thoughts of mortality bring.

The general conclusions that can be drawn from this study are that the odes richly deserve the high place that has been accorded them, though Keats is not absolutely cleared of the charge that the aestheticism of his Romantic ontology limits the ultimate profundity of his poems.

305 pages. \$3.81. MicA54-1794

LIBRARY SCIENCE

MAHATMA GANDHI:
A DESCRIPTIVE BIBLIOGRAPHY

(Publication No. 8408)

Jagdish Saran Sharma, Ph. D.
University of Michigan, 1954

The purpose of this study is to present, in one volume, annotated references to the voluminous works in print, by and about Gandhi, buried in numerous books, periodicals and society publications all classified and arranged in a systematic order. It also presents a chronology of the main events of Gandhi's life and of his non-violent struggle for India's independence from October 2, 1869 to January 30, 1948, depicting the significant trends in his writings and speeches.

The total number of entries included in this study is 3376. About 89.8 per cent are in English, the rest are in nine major languages, i.e., Dutch, French,

German, Italian, Norwegian, Portuguese, Russian, Spanish and Swedish. The period covered by Gandhi's writings is from June 13, 1891 to January 30, 1948. The writings about Gandhi cover the period between October, 1908 and early 1954.

The writings by Gandhi are in the form of articles, speeches, letters, and reports of interviews, which are edited by several editors either in the form of collected writings or selections. The writings about him are in the form of complete biographies, brief biographical essays, treatises on his philosophy of *Satyagraha* or non-violent resistance, articles, letters, poems, reports of interviews and homages. These writings come from the pens of Gandhi's admirers, his friendly critics and bitter opponents.

To examine closely this multisided Gandhian literature I have divided it into the following eight convenient phases, i.e., (1) Childhood, education, marriage, 1869-1893; (2) South Africa, 1893-1914;

(3) Return from South Africa to India and early activities, 1915-1919; (4) Non-violent non-co-operation movement, 1920-1929; (5) First and Second Civil Disobedience movements, 1930-1940; (6) Individual Satyagraha, "Quit India" movement and after, 1941-1946; (7) Unity efforts and assassination, 1947 to January 30, 1948; and (8) After his death, February, 1948 to early 1954. About each phase and its principal events is listed literature by and about Gandhi. People all over the world either praised or criticised him for his words and deeds.

The Bibliography is divided into four main parts. Each part is further divided into sections and sub-sections. These sections and sub-sections are further divided into 559 alphabetically arranged subject headings. Under these subject headings annotated entries, with complete bibliographical information, are arranged alphabetically.

Part I contains 99 entries and is divided into the following five sections: A. Library catalogues; B. Bibliographies and indexes; C. Trade and national bibliographies; D. Gandhi bibliographies; and E. Periodicals which took special interest in printing literature on India's struggle for independence and regularly reviewed Gandhian literature.

Under Part II are listed alphabetically 77 collected works of Gandhi, selections from his writings, and collected writings of others on him.

Part III forms the main body of the Bibliography and is divided into the following three sections: A.

Chronology from October 2, 1869 to January 30, 1948; B. General biographies; and C. Subject approach. Under section B Gandhi's biographies are listed chronologically from 1909 to early 1954. They are arranged alphabetically under each year, with complete bibliographical information and annotations. The total number of biographies is 274. Section C, Subject approach, is the biggest section of the Bibliography and contains 2881 entries. These annotated entries are arranged alphabetically under 559 subject headings which are also arranged alphabetically. The subject headings fall into four categories: general subjects; Gandhi as a subject; see references and see also references.

Part IV has the following three sections: A. Books which influenced Gandhi's life and thought; B. Books for which Gandhi wrote forewords and C. Periodicals Gandhi edited and sponsored. The entries are arranged alphabetically under each section.

In conclusion, I may say that this study, being the tenth Ph. D. thesis so far submitted in Indian, American and European universities on Gandhi's philosophy of Satyagraha or non-violent resistance and his struggle for India's independence, aims to examine and analyse, with detachment and objectivity, literature by and about Gandhi in ten major non-Indian languages in order to assist scholars all over the world interested in Gandhian philosophy.

560 pages. \$7.00. MicA54-1795

MATHEMATICS

RELATIVE COHOMOLOGY THEORY OF GROUPS AND CONTINUATIONS OF HOMOMORPHISMS

(Publication No. 8601)

Maurice Auslander, Ph.D.
Columbia University, 1954

Let π be a subgroup of Π and suppose we are given an operation of Π on a left K -module C , where K is a commutative ring with unit, such that $k(xc) = x(kc)$ for all x in Π , k in K and c in C . Then C can be considered a left $K(\Pi)$ -module where $K(\Pi)$ denotes the group ring of Π over K . Let $I(\Pi)$ be the two sided ideal in $K(\Pi)$ which consists of all elements $\sum k_i x_i$ in $K(\Pi)$ where $k_i \in K$, $x_i \in \Pi$, such that $\sum k_i = 0$. For all integers $q \geq 0$, we define $H^q(\Pi, \pi; C)$, the q -dimensional relative cohomology group of Π mod π with coefficients in C , to $\text{Ext}^{q-1}(I(\Pi)/K(\Pi)I(\pi), C)$. It is the purpose of the thesis to study the groups $H^q(\Pi, \pi; C)$.

The first results obtained are of a formal nature dealing with exact sequences and what happens when is trivial. It is shown that there exists an exact sequence

$$\dots \rightarrow H^{q-1}(\pi, C) \rightarrow H^q(\Pi, \pi; C) \rightarrow H^q(\Pi, C) \rightarrow \dots$$

where $H^q(\Pi, C)$ are the usual q -dimensional cohomology groups of Π with coefficients in C . If π' is a subgroup of π we deduce the exact sequence of a triple

$$\dots \rightarrow H^q(\Pi, \pi; C) \rightarrow H^q(\Pi, \pi'; C) \rightarrow H^q(\pi, \pi'; C) \rightarrow \dots$$

In the case that $\pi = \{1\}$, then

$$H^q(\Pi, 1; C) \approx H^q(\Pi, C) \quad q \geq 2$$

$$H^1(\Pi, 1; C) \cong Z^1(\Pi, C)$$

where $Z^1(\Pi, C)$ is the group of crossed homomorphisms of Π into C .

Next, the following general theorem is proven. If A, B, C , are left $K(\Pi)$ -modules and B is K -projective, then $\text{Ext}_{\Pi}^q(A \otimes_K B, C) \approx \text{Ext}_{\Pi}^q(A, \text{Hom}_K(B, C))$ for all $q \geq 0$. Using this result we establish the following theorems.

First it is shown how the relative cohomology groups can be expressed in terms of the ordinary cohomology groups. This is given by the relation

$$H^q(\Pi, \text{Hom}_K(I(\Pi/\pi), C)) \approx H^{q+1}(\Pi, \pi; C) \quad q \geq 0,$$

where the operation of π on $\text{Hom}_K(I(\Pi/\pi), C)$ is the obvious one.

Secondly, we show that if $H^q(\Pi, \pi; C) = 0$ for some $q > 0$ and all left $K(\Pi)$ -modules C , then $H^q(\Pi, C) = 0$ and $H^{q-1}(\pi, C) = 0$ for all left $K(\Pi)$ -modules C .

These results are followed by the derivation of a closed formula for the calculation of $H^q(\Pi, \pi; C)$ in the case that Π is a finite cyclic group.

The section dealing with the formal properties of the relative cohomology groups of groups closes with a description of the relative groups in terms of the non-homogeneous cochains introduced by Eilenberg and Mac Lane.

The rest of the thesis is devoted to the application of relative cohomology groups of groups to a problem in group extensions.

Given the groups K, G and a homomorphism $\phi: K \rightarrow G$, we define a continuation of this homomorphism to be a triple $(E, \bar{\phi}, \sigma)$ such that $(E, \bar{\phi})$ is an extension of G by $\phi^{-1}(1) = X$ and $\sigma: K \rightarrow E$ is a monomorphism such that the following diagram commutes

$$\begin{array}{ccccccc} 0 & \rightarrow & X & \rightarrow & K & \xrightarrow{\phi} & N \rightarrow 0 \\ & & \uparrow & & \downarrow \sigma & \bar{\phi} & \downarrow \\ 0 & \rightarrow & X & \rightarrow & E & \rightarrow & G \rightarrow 0 \end{array}$$

where all the rows are exact, $N \phi(K)$, and all unmarked maps are inclusion maps.

Since K is an extension of N by X , K gives rise to a N -kernel $\bar{\theta}: N \rightarrow A(X)/I(X)$ where $A(X)$ and $I(X)$ are the automorphism and inner automorphism groups respectively. If $(E, \bar{\phi}, \sigma)$ is a continuation of $\phi: K \rightarrow G$, then since $(E, \bar{\phi})$ is an extension of G by X , it induces a G -kernel $\theta: G \rightarrow A(X)/I(X)$ which is an extension of the N -kernel $\bar{\theta}$. Any G -kernel which is an extension of the N -kernel $\bar{\theta}$ is called a semi-module.

It is shown that given a semi-module $\theta: G \rightarrow A(X)/I(X)$. The group $H^2(G, N; Z_X)$, where Z_X is the center of X and where the operation of G on Z_X is the usual one, operates transitively and without fixed points on the set of suitably defined isomorphism classes of continuations of the homomorphism $\phi: K \rightarrow G$ which induce the given semi-module provided that set is not empty. Also an obstruction theory to the existence of continuations giving rise to the given semi-module is established. Finally, the results of J. H. C. Whitehead concerning operator extensions are obtained as a special case of the above theory.

70 pages. \$1.00. MicA54-1796

EXACT CATEGORIES AND DUALITY

(Publication No. 8619)

David Alvin Buchsbaum, Ph.D.
Columbia University, 1954

Throughout the book, *Homological Algebra* by H. Cartan and S. Eilenberg (to be published shortly), the authors dealt with functors defined on categories of modules over certain rings and whose values again were modules over a ring. It will be shown in this paper that the theory may be generalized to functors defined on abstract categories, i.e., exact categories.

The advantages of such an abstract treatment are manifold. We list a few:

1) The dualities of the type

kernel	-----	cokernel
projective	-----	injective
$Z(A)$	-----	$Z'(A)$

may now be formulated as explicit mathematical theorems.

2) In treating derived functors, it suffices to consider left derived functors of a covariant functor of several variables; all other types needed may then be obtained by a dualization process.

3) Further applications of the theory of derived functors are bound to show that the consideration of modules over a ring Λ will be insufficient.

In this paper, we first define exact categories, prove the duality theorem, and demonstrate certain lemmas which are essential to the application of the theory. We then treat homology in an exact category, and define functors of one variable, obtaining for such functors the maps α and α' relating $HT(A)$ to $TH(A)$.

In Chapter III we deal with direct sums, projective and injective objects, functors of several variables, and finally with the left and right derived functors.

In Chapter IV, two applications of the duality principle are given, in one of which it is shown that every compact abelian group is the quotient of a projective compact abelian group. Also, some indication of how dimension is introduced in categories, following the notion for algebras, is given in that chapter.

96 pages. \$1.20. MicA54-1797

EIGENFUNCTION EXPANSIONS ASSOCIATED WITH CERTAIN IRREDUCIBLE PARTIAL DIFFERENTIAL EQUATIONS

(Publication No. 8519)

Clinton Burke Gass, Ph.D.
University of Nebraska, 1954

Adviser: Chester C. Camp

The first expansion considered is related to the partial differential equation $\frac{\partial U}{\partial x_1} + \dots + \frac{\partial U}{\partial x_p} + [\lambda + k(x_1, \dots, x_p)]U = 0$, where λ is a parameter, and p boundary conditions. This problem cannot be treated by the usual method of reduction to a system of ordinary differential equations.

In studying an eigenfunction expansion problem it is necessary that an infinite number of eigenvalues exist for each parameter. The above problem presents difficulties when one attempts to use the usual boundary conditions, for the p parameters appear in p different relations each involving $p-1$ variables. By using conditions involving averages along the boundaries instead of values at points on the boundaries, it is possible to obtain the necessary countably infinite number of eigenvalues, and by employing the contour

integral method for proving convergence, the following theorem is established:

Theorem 1. Let $f(x_1, \dots, x_p)$ be defined in the region $T: -\pi \leq x_i \leq \pi, i=1, \dots, p$, such that it consists of a finite number of pieces, each real, continuous and possessing continuous first order partial derivatives in each of the p variables. With suitable boundary conditions, the multiple parameter expansion

$$\sum_{n,j,\dots,r=-\infty}^{\infty} C_{n,j,\dots,r} U^*(x_1, \dots, x_p; \lambda_n, \mu_{1,j}, \dots, \mu_{p-1,r})$$

$$\text{where } C_{n,j,\dots,r} = \int_{-\pi}^{\pi} \dots \int_{-\pi}^{\pi} f(x_1, \dots, x_p) V^* \prod_{i=1}^p dx_i / (2\pi)^p$$

$$U^* = \exp[-\lambda x_1 + \mu_{1,j}(x_1 - x_2) + \dots + \mu_{p-1,r}(x_1 - x_p) + g(x_1, \dots, x_p)],$$

V^* is an eigenfunction of the adjoint system with the same set of eigenvalues as U^* , and it is given by $V^* =$

$$1/U^*, g(x_1, \dots, x_p) \text{ being given by } \frac{\partial g}{\partial x_1} + \dots + \frac{\partial g}{\partial x_p} =$$

$-k(x_1, \dots, x_p)$, where k is integrable over T in each argument, but it is not a sum of functions each of a single variable, converges to the mean value of f at any interior point, and in any closed region in which f and its first partial derivatives are continuous, the series converges uniformly to f .

Next is considered the given partial differential equation with $p=2$ and with auxiliary conditions involving interior points as well as points on the boundary. These conditions are

$$C \int_{-\pi}^{0-} [1 - \frac{U(\pi, y)}{U(-\pi, y)}] dy + \int_{0+}^{\pi} [1 - \frac{U(\pi, y)}{U(-\pi, y)}] dy = 0$$

$$\int_{-\pi}^{\pi} [1 + \frac{2a U(x, 0)}{U(x, \pi)} - \frac{U(x, -\pi)}{U(x, \pi)}] dx = 0,$$

where C and a are non-vanishing constants, with similar adjoint conditions. The associated expansion and convergence are established, and the results are given in the

Theorem 2. Let $f(x, y)$ be defined in the region $T: -\pi \leq x \leq \pi, -\pi \leq y \leq \pi$ such that it consists of a finite number of pieces, each real, continuous and possessing a continuous partial derivative in x and in y . Then

the expansion associated with $\frac{\partial U}{\partial x} + \frac{\partial U}{\partial y} + [\lambda + k(x, y)]U = 0$, its adjoint and suitable auxiliary conditions involving interior points as well as boundary points, converges to the mean value of $f(x, y)$ at any interior point, and in any closed region in which $f(x, y)$ and its two first partial derivatives are continuous, the series converges uniformly to $f(x, y)$.

The last problem, that of the expansion associated with $\frac{\partial U}{\partial x} + \frac{\partial U}{\partial y} + \{\lambda[a(x) + b(y)] + k(x, y)\}U = 0$ where a and b are integrable functions of x and y respectively, while k and the boundary conditions are the same as in the first case, is briefly considered. The fact that the coefficient of the parameter may change sign or otherwise vanish in the region T makes the analysis more difficult. However, one may state the following

Theorem 3. Let $f(x, y)$ be defined as in theorem 2. The expansion associated with the above equation and

and boundary conditions will converge, but not always to the mean value of f .

28 pages. \$1.00. MicA54-1798

A GENERALIZED FORM OF THE PROBLEM OF BOLZA IN THE CALCULUS OF VARIATIONS

(Publication No. 8360)

Douglas Vern Newton, Ph.D.
University of Washington, 1954

The problem to be considered is as follows: Find, in a class of arcs

$$y_j = Y_j(x) \quad (j = 1, \dots, n; x_1 \leq x \leq x_2)$$

satisfying the differential equations

$$\phi_\beta(x, y, x_1, y_{j1}, x_2, y_{j2}, y') = 0 \quad (\beta = 1, \dots, m)$$

and end conditions

$$\psi_\mu(x_1, y_{j1}, x_2, y_{j2}) = 0 \quad (\mu = 1, \dots, p),$$

one which minimizes the sum

$$J = g(x_1, y_{j1}, x_2, y_{j2}) + \int_{x_1}^{x_2} f(x, y, x_1, y_{j1}, x_2, y_{j2}, y') dx.$$

The functions $f, \phi_\beta, g, \psi_\mu$ are real single valued

functions and are supposed to have continuous partial derivatives of at least the third order. The functions $Y_j(x)$ have continuous derivatives of at least the first order on the interval $x_1 \leq x \leq x_2$.

It is the object of this paper to obtain a set of necessary conditions and a sufficient condition for an arc E to be a minimizing arc.

Let the function $F(x, y, x_1, y_{j1}, x_2, y_{j2}, y', X)$ be defined as

$$F = X_0 f + X_\beta(x) \phi_\beta$$

for a given constant X_0 and functions $X_\beta(x)$. An arc

E is said to satisfy the multiplier rule if there exist constants (X_0, e_μ) and multipliers $X_\beta(x)$, continuous on the interval $x_1 \leq x \leq x_2$, such that the following conditions are satisfied:

1) The equations

$$F_{y'_j} = \int_{x_1}^x F_{y_j} dx + c_j \quad \phi_\beta = 0$$

hold along E .

2) The equations

$$\begin{aligned} & [(F - y'_j F_{y'_j}) dx + F_{y'_j} dy_j]_1^2 + X_0 dg + e_\mu d\psi_\mu + \\ & \left[\int_{x_1}^{x_2} F_{x_1} dx \right] dx_1 + \left[\int_{x_1}^{x_2} F_{y_{j1}} dx \right] dy_{j1} + \left[\int_{x_1}^{x_2} F_{x_2} dx \right] dx_2 + \\ & \left[\int_{x_1}^{x_2} F_{y_{j2}} dx \right] dy_{j2} \equiv 0 \\ & \psi_\mu = 0 \end{aligned}$$

hold at the ends of E for all choices of the differentials dx_1, dy_{j1}, dx_2 and dy_{j2} . It is shown that every minimizing arc must satisfy the multiplier rule.

Next, the imbedding theorem is obtained. This states that a normal arc E satisfying the equations

$$\phi_\beta = \psi_\mu = 0$$

can be imbedded in a one parameter family of arcs of the same type. A discussion of abnormal arcs is then taken up resulting in the condition that an arc E have abnormality q if and only if the maximum rank attainable for the matrix

$\|\psi_\mu(\xi, \eta)\|$ is $p - q$, where the maximum rank is taken over all sets of admissible variations $\xi_1, \xi_2, \eta_j(x)$ satisfying the equations of variation along E .

A minimizing arc E , which satisfies the multiplier rule with multipliers $X_0 = 1, X_\beta(x)$, must satisfy the Weierstrass condition and the Clebach condition. If the minimizing arc E is normal, then the second variation $J_2(\xi, \eta)$ must be non-negative for all sets of admissible variations satisfying the equations of variation along the arc E .

Finally, we obtain a set of conditions which constitute a sufficient condition for an arc E to be a minimizing arc. 65 pages. \$1.00. MicA54-1799

ON THE NUMBER OF LINEAR GRAPHS WITH GIVEN BLOCKS

(Publication No. 8391)

Robert Zane Norman, Ph.D.
University of Michigan, 1954

In his Gibbs Lecture to the American Mathematical Society, G. E. Uhlenbeck pointed out that in the virial development of the equation of state of a monoatomic gas, there arise some interesting combinatorial problems for the theory of linear graphs. One of these problems is the development of a generating function for counting Husimi trees. A Husimi tree is a connected graph in which each line is contained in at most one cycle.

In this thesis, a generating function for counting graphs with given blocks is derived. The counting series for Husimi trees is a special case of this generating function.

In determining the number of trees, Otter (Ann. of Math., 49 (1948), pp. 583-599) made use of a relation called the dissimilarity characteristic. He used the relation to obtain the counting series for trees from the known counting series for rooted trees. In the first part of this thesis, Otter's dissimilarity characteristic for trees is generalized to Husimi trees, and then to general linear graphs.

To carry out this generalization, the concepts of dissimilarity cycle basis, exceptional cycle, and regular cycle are developed. The dissimilarity characteristic equation for connected linear graphs states that for any connected graph G ,

$$p - (k - \bar{k}) + (c - \bar{c}) = 1,$$

where p and k are the number of classes of similar points and lines of G respectively, \bar{k} is the number of classes of lines of G whose endpoints are similar, c is the number of cycles in a dissimilarity cycle basis

of G , and \bar{c} is the number of exceptional cycles of the cycle basis.

In the second part of the thesis, the counting series for graphs and rooted graphs with given blocks are developed. A block of a graph G is a maximal connected subgraph of G having no articulation points. In obtaining these counting series, repeated use is made of the principal theorem of Polya (Acta Math., 68 (1937), pp. 145-254).

The generating function for counting rooted graphs with given blocks is obtained by generalizing the method of Harary and Uhlenbeck (Proc. Nat. Acad. Sci. U.S.A., 39 (1953), pp. 315-322). The procedure involves two applications of Polya's theorem. Let A_n be the number of rooted graphs with n points whose blocks are taken from some collection C . Let $F(x)$

be the formal power series, $F(x) = \sum_{n=0}^{\infty} A_n x^n$. Then

$F(x)$ satisfies the recursion equation,

$$F(x) = x \exp \sum_{r=1}^{\infty} \frac{1}{r} P(F(x^r)),$$

where P is a polynomial depending on the automorphism groups of the blocks of C .

Next, a relation similar to the dissimilarity characteristic equation is developed. Using this relation, one can develop the counting series for graphs whose blocks are given. Let a_n be the number of graphs with n points whose blocks are taken from C . Let

$$f(x) = \sum_{n=0}^{\infty} a_n x^n.$$

Again making use of Polya's theorem, it is shown that

$$f(x) = F(x) - Q(F(x)),$$

where Q is a polynomial depending on the automorphism groups of blocks of C .

Specific examples of generating functions are derived, and, in particular, the generating functions for Husimi trees and rooted Husimi trees is presented. In the appendix, the counting series for Husimi trees whose blocks are cycles of length four is illustrated; all such Husimi trees with at most six blocks are drawn.

66 pages. \$1.00. MicA54-1800

APPROXIMATION BY BOUNDARY VALUES OF ANALYTIC FUNCTIONS

(Publication No. 8477)

Jacqueline Lydie Penez, Ph.D.
University of Minnesota, 1954

We discuss the problem of minimizing the $\int_C |f(z) - p(z)|^k |dz|$ for $1 < k < \infty$, where C is the rectifiable boundary of a multiply-connected domain D , $f(z)$ is a complex-valued function whose k th power is Lebesgue integrable on C and $p(z)$ ranges over the boundary functions of functions analytic in D .

We let D be a finite region of the z -plane bounded by a system of curves C , consisting of an outer

rectifiable Jordan curve C_0 and v rectifiable Jordan curves C_1, \dots, C_v lying within C_0 and having no points in common with it or with each other. We let $z(s)$ be the parametric representation of C in terms of arc length along C . By $L^k(C)$ where $1 \leq k < \infty$, we denote the class of all complex valued functions

$f(z)$ defined on C such that $(\|f\|_k)^k = \int_C |f(z)|^k ds$

exists finite in the Lebesgue sense. The class $B^k(C)$ denotes the subclass of functions in $L^k(C)$ which satisfy:

$$(i) \int_C f(z) z^n dz = 0 \text{ for } n = 0, 1, 2, \dots,$$

$$(ii) \int_C f(z) (z-a_i)^{-n} dz = 0 \text{ for } n = 1, 2, \dots,$$

where $a_i \in \text{Int}(C_i)$, $i = 1, \dots, v$.

Another subclass of $L^k(C)$ to be considered is

$$A^k(C) = \{f|C \mid f \text{ analytic in } \bar{D}\}$$

where the closure is taken in the space $L^k(C)$. We note that $A^k(C) \subseteq B^k(C)$ for $1 \leq k < \infty$.

Definition of Smirnov domains:

(i) Let D be the interior of a rectifiable Jordan curve and let $z = \varphi(t)$ map $|t| < 1$ conformally onto D . If $\log |\varphi'(t)|$ has a Poisson-Lebesgue integral representation, then D is of Smirnov type.

(ii) Let D be the exterior of a rectifiable Jordan curve C and $a \in \text{Int}(C) \{z \mid |z-a| \leq r\} \subseteq \text{Int}(C)$. In this case, D is of Smirnov type if D' is of Smirnov type where D' is the image of D under $z = \psi(w) = (r/w) + a$.

(iii) Let D be a finitely multiply connected domain with a boundary C as described above. Then D is of Smirnov type if $\text{Int}(C_0)$ and $\text{Ext}(C_i)$ for $i = 1, \dots, v$ are domains of Smirnov type. We let S denote the class of domains of Smirnov type.

To $f(z) \in B^k(C)$ corresponds a function $F(z)$ analytic in D , whose non-tangential boundary values coincide with $f(z)$ on C . If $D \in S$, then $A^k(C) = B^k(C)$ for $1 < k < \infty$. If $D \in S$ and is simply-connected, then $B(H_k(D)) = B^k(C) = A^k(C)$ for $1 \leq k < \infty$ where $B(H_k(D))$ denotes the class of boundary functions of functions in $H_k(D)$, the Hardy classes.

Theorem 1. Let $f(z) \in L^k(C)$ where $1 < k < \infty$. Then there exists a unique function $g(z) \in B^k(C)$ (or $A^k(C)$) such that $\|f - g\|_k = \inf \|f - h\|_k$. We call the function $g(z)$ which minimizes $\|f - h\|_k$ over $B^k(C)$ (or $A^k(C)$) the minimizing function and the difference $f(z) - g(z)$ a minimal function.

Theorem 2. Let $0 \neq f(z) \in L^k(C)$ where $1 < k < \infty$. Then $f(z)$ is minimal over $A^k(C)$ (or $B^k(C)$) if and only if $|f|^k/z'(s)$ coincides on C with a function $F(z) \in B^q(C)$ (or $A^q(C)$) where $1/k + 1/q = 1$. Minimal functions can vanish at most on a set of measure zero.

Theorem 3. For each $w(z) \in L^q(C)$ ($1 < q < \infty$) where $1/k + 1/q = 1$, the function L defined for $f(z) \in B^k(C)$ (or $A^k(C)$) by $L(f) = \int_C f(z) w(z) dz$ is a linear functional on $B^k(C)$ (or $A^k(C)$) and

$$\|L\|_{B^k} = \max_{\|f\|_k \leq 1} |L(f)| = \min_{g \in A^q} \|w - g\|_q$$

$$f \in B^k$$

$$(\text{or } \|L\|_{A^k} = \max_{\|f\|_k \leq 1} |L(f)| = \min_{g \in B^q} \|w - g\|_q).$$

$$f \in A^k$$

$$\text{In fact } \|L\|_{B^k(\text{or } A^k)} = \left| \frac{L(F)}{\|F\|_k} \right| = \|w - g_0\|_q \text{ where}$$

$g_0(z)$ is the minimizing function over $A^q(C)$ (or $B^q(C)$) of $w(z)$ and $F(z) = |w(z) - g_0(z)|^q / z'(s)(w(z) - g_0(z))$. Conversely, if L is a linear functional on $B^k(C)$ (or $A^k(C)$), then there exists $w(z) \in L^q(C)$ such that $L(f) = \int_C f(z) w(z) dz$ and $\|L\|_{B^k}$ (or $\|L\|_{A^k}$) is as above.

The case where D is a simply-connected domain of Smirnov type is discussed further.

99 pages. \$1.24. MicA54-1801

ON LOCALLY COMPACT TOTALLY DISCONNECTED ABELIAN GROUPS AND THEIR CHARACTER GROUPS

(Publication No. 8482)

Gerald Cowles Preston, Ph.D.
University of Minnesota, 1954

Let G and g be separated Abelian topological groups. We denote by (G, g) the group of all continuous homomorphisms of G into g , (G, g) being provided with the compact-open topology. (A neighborhood of 0 in (G, g) will be the set of all $\alpha \in (G, g)$ such that $\alpha(C) \subset V$, where C is a compact subset of G and V is a neighborhood of 0 in g .) We shall investigate possible groups g with the property that $((G, g), g) \cong G$ for all locally compact totally disconnected Abelian groups G where \cong denotes an algebraic isomorphism and topological homomorphism.

The following facts are valid: (1) if G is a locally compact Abelian group which has sufficiently many continuous homomorphisms into g , then there is a one to one continuous image of G included in

$$((G, g), g). \quad (2) \quad \left(\prod_1^n G_i, g \right) \cong \prod_1^n (G_i, g). \quad (3) \quad \left(G, \prod_1^n g_i \right) \cong \prod_1^n (G, g_i).$$

(4) If g is discrete and G is compact, then (G, g) is discrete. (5) If g is discrete and G is a locally compact Abelian group, $(G, g) \cong (\hat{G}, \hat{g})$ where $\hat{g} = (g, K)$, K being the circle or multiplicative group of complex numbers of absolute value 1.

If H is any subgroup of G and H^* represents the set of all $\alpha \in (G, g)$ for which $\alpha(H) = \{0\}$, the following theorems are true: (1) H^* is a closed subgroup of (G, g) . (2) $(G - H, g) \cong H^*$ where \cong represents an algebraic isomorphism. (3) If H is an open compact subgroup of G , then $(G - H, g) \cong H^*$. (4) If g is a divisible group and H is an open subgroup of G , then $(H, g) \cong (G, g) - H^*$. (5) If g is a discrete divisible group and H is an open compact subgroup of G , then $(H, g) \cong (G, g) - H^*$.

If we denote by Q_p the p -adic numbers, by Z_p the

p -adic integers, by $p^{\infty d}$ the group $Q_p - Z_p$ with discrete topology, and by $p^{\infty \tau}$ the group $Q_p - Z_p$ with the topology τ , we have the following theorems concerning p -primary groups: (1) If g is an Abelian p -primary group, $(Z_p, g) \cong g$ and if g is a locally compact Abelian p -primary group $(Z_p, g) \cong g$. (2) If g is a locally compact Abelian p -primary group $(G, p^{\infty d})$, $p^{\infty d} \cong G$. Also if τ is any separated topology, $((G, p^{\infty \tau}), p^{\infty \tau}) \cong G$. (3) It may be shown on the basis of the preceding theorem and a theorem by Kaplansky² that any homomorphic mapping of a locally compact p -primary group into $p^{\infty d}$ is a continuous mapping.

It is yet possible that some group g other than $p^{\infty \tau}$ or the circle K will have the property that for any locally compact Abelian p -primary group G , $((G, g), g) \cong G$. A few theorems are given which limit the groups which could have this property, namely; if g is an Abelian p -primary group such that $((G, g), g) \cong G$ for all locally compact Abelian p -primary groups G , then: (1) If (G, g) is always a locally compact Abelian group, $g \cong p^{\infty d}$. (2) If g is locally compact, $g \cong p^{\infty d}$. (3) Let g^{∞} be the subgroup of elements in g of finite order and infinite height. Then if $g \not\cong p^{\infty d}$, $g \cong$ an infinite direct product of groups isomorphic to $p^{\infty d}$, and g must contain arbitrarily small compact non-open subgroups.

If G is a compact totally disconnected group and

$$g = \prod_i^{\infty} p_i^{\infty \tau_i} \text{ where } p_1, p_2, \dots \text{ represent all prime}$$

numbers and the τ_i are any separated topologies, then $((G, g), g) \cong G$. If G is any locally compact totally dis-

connected Abelian group and $g^d = \text{wk } \prod_i^{\infty} p_i^{\infty} = \left\{ \text{the subgroup of } \prod_i^{\infty} p_i^{\infty d} \text{ with all but a finite number of components } 0, \text{ provided with the discrete topology} \right\}$, then $((G, g^d), g^d) \cong G$. If g^{τ} is the algebraic group g^d with separated topology τ , then a necessary and sufficient condition that $((G, g^{\tau}), g^{\tau}) \cong G$ is that g^{τ} have a neighborhood of 0 containing no non-zero subgroup.

An application of the above theory shows that there will be sufficiently many representations (continuous homomorphisms) of any locally compact Abelian totally disconnected group in the multiplicative group of any algebraically closed field of characteristic 0 . Also it is shown that if G is a locally compact Abelian p -primary group with all its non-zero elements of infinite order and infinite height such that elements of infinite height are everywhere dense in \hat{G} , there are sufficiently many representations of G in the additive group of Q_p .

Simple remarks reduce the question of sufficiency of representations of compact Abelian p -primary groups in a group g to the case of sufficiency of representations of finite groups in g . This shows that a compact Abelian p -primary group cannot have elements of infinite height and that there exist no divisible compact totally disconnected groups. Also a compact p -primary group will have sufficiently many representations in a multiplicative group of finite matrices with entries in \mathbb{Z}_p' , $p' \neq p$.

57 pages. \$1.00. MicA54-1802

1. J. Braconnier, *Sur les groupes topologiques localement compacts*, J. Math. Pures Appl. vol. 27 (1930) pp. 1-85.

2. I. Kaplansky, *Dual modules over a valuation ring*, Proc. Am. Math. Soc. vol. 4, no. 2 (1953) pp. 213-219.

EQUICONTINUITY OF LINEAR TRANSFORMATIONS

(Publication No. 8399)

Ralph Alexis Raimi, Ph.D.
University of Michigan, 1954

The purpose of this study is to apply the duality theory of locally convex topological linear spaces to determine the relationships which obtain between equicontinuity of sets of linear transformations and the topology of the spaces involved. To this end it proves convenient to regard such a linear space as a space of continuous functions over its adjoint space. This procedure suggests another, closely related: A linear space may also be regarded as a space of functions from the space of linear continuous transformations to the original linear space. These two methods are studied and related to each other.

First, the duality theory of the linear system (E, E') is set forth, where E is a linear space and E' some total set of linear functionals (or forms) on E , largely as developed by Dieudonné, Mackey, and Arens. The space $L(E, F)$ of weakly continuous transformations from E to F is then introduced, and a criterion given by which equicontinuous subsets of $L(E, F)$ may be distinguished. This criterion involves the behavior of the subsets of $L(F', E')$ made up of the adjoints of the equicontinuous sets, and is applied in cases where E and F are given certain well-known topologies defined by means of the duality theory. These are the relatively strong and relatively weak topologies of Mackey-Arens, and the k -topology of Arens. In particular, equicontinuity for the k -topologies of E and F is related to compactness in $L(F', E')$, when provided with a suitable function space topology.

In the case where E and F are the same space, it is proved that the topology of E is determined by the assignment of equicontinuous subsets of $L(E, E)$, and that stronger topologies correspond to larger equicontinuous sets.

Finally, E is regarded as a set of functions on $L(E, E)$ to E , and is given topologies of pointwise convergence over certain subsets of $L(E, E)$. The ideals

in $L(E, E)$ induce, by this method, particularly attractive topologies, of which one is studied in some detail; this is the case where the ideal is made up of all transformations which carry a bounded subset of E onto a subset totally bounded in the relatively strong structure of E . 62 pages. \$1.00. MicA54-1803

AUTOMORPHISMS OF THE PROJECTIVE UNITARY GROUPS

(Publication No. 8433)

John Harris Walter, Ph.D.
University of Michigan, 1954

Let E be a right vector space of dimension n over a field K which possesses an involutive anti-automorphism J . Let f be a non-degenerate hermitian sesquilinear form defined on E relative to the anti-automorphism J . The unitary group $U_n(K, f)$ is the group of linear transformations of E which leave f invariant. Denote by $P(E)$ the projective space consisting of the 1-dimensional subspaces of E . Designate by C_n the normal subgroup of $U_n(K, f)$ consisting of those elements which leave invariant the 1-dimensional subspaces of E . Then the group $PU_n(K, f) = U_n(K, f)/C_n$ is the projective unitary group; it is the factor group of $U_n(K, f)$ which acts faithfully on $P(E)$. The object of this dissertation is to determine the automorphisms of $PU_n(K, f)$.

We require that n be greater than 4 and not 6. For the sake of convenience, we assume that n is finite although our methods directly and easily extend to the infinite dimensional case. Then we show that every automorphism φ of $PU_n(K, f)$ is of the form $\varphi(\bar{t}) = \bar{r}^{-1}t\bar{r}$ where \bar{r} is a collineation of $P(E)$ induced by a semilinear transformation r of E relative to an automorphism σ of K such that for all x and y in E

$$f(r(x), r(y)) = e_r f(x, y)^\sigma$$

where e_r is an element of K independent of x and y .

The method of proof is as follows. The elements \bar{t} of $PU_n(K, f)$ are considered to be cosets in $U_n(K, f)$. If \bar{u} is an involution of $PU_n(K, f)$ and u is in \bar{u} , then $u^2(x) = x\gamma$ for all x in E where $\gamma^J\gamma = 1$ and γ is in Z , the center of K . We classify the involutions of $PU_n(K, f)$ according to relations satisfied by γ . In particular, if $\gamma = \lambda^2$ with λ in Z and $\lambda^J\lambda = 1$, \bar{u} is said to be an involution of the first kind. Such involutions, considered as cosets of $U_n(K, f)$ contain involutions of $U_n(K, f)$. If they contain involutions with 1-dimensional eigenspaces, they are said to be extremal involutions. It has been shown by Dieudonné and Rickart that the characterization of such involutions strictly in terms of the multiplicative structure of $PU_n(K, f)$ leads to the characterization of the automorphisms of $PU_n(K, f)$. Our principal theorem yields this characterization for $PU_n(K, f)$.

If $\bar{\mathcal{I}}$ is a set of involutions of $PU_n(K, f)$, denote by $c(\bar{\mathcal{I}})$ those involutions of $PU_n(K, f)$ which commute with the elements of $\bar{\mathcal{I}}$. In particular, if \bar{u} and \bar{v} are distinct commuting involutions, denote by $v(\bar{u}, \bar{v})$ the order of $c(\bar{u}, \bar{v})$ and by $v_{\bar{u}}$ the maximum of $v(\bar{u}, \bar{v})$

for all involutions \bar{v} commuting with \bar{u} . Let \mathcal{I} be the set of involutions \bar{u} for which $v_{\bar{u}} = 4$. For the general linear and unitary groups, Rickart showed that \mathcal{I} consists only of extremal involutions. In the case of the projective unitary groups, we show that \mathcal{I} contains the extremal involutions along with two other classes of involutions. To distinguish extremal involutions from these other involutions group-theoretically, we denote by $\omega(\bar{u}, \bar{v}, \bar{w})$ the order of $c(c(\bar{u}, \bar{v}), \bar{w})$ where \bar{u} , \bar{v} , and \bar{w} are distinct mutually commuting involutions in \mathcal{I} and by $\omega_{\bar{u}}$ the maximum of $\omega(\bar{u}, \bar{v}, \bar{w})$ for all such \bar{v} and \bar{w} . (It is important to note that it is necessary to require that \bar{u} , \bar{v} , and \bar{w} be in \mathcal{I} .)

For this reason the first part of this dissertation is devoted to the characterization of \mathcal{I} .)

Let \mathcal{J} denote the set of involutions for which $\omega_{\bar{u}} = 8$. Let $\kappa_{\bar{u}}$ denote the maximum number of involutions of \mathcal{J} contained in any maximal set of commuting involutions containing \bar{u} . Then our principal theorem states that an extremal involution \bar{u} is characterized by the following group-theoretical conditions; \bar{u} is in \mathcal{J} , $\kappa_{\bar{u}} = n$, and any product of two or three involutions of \mathcal{J} commuting with \bar{u} is not in \mathcal{I} . If $n \neq 8$ and $n \neq 12$, it is sufficient to require merely that \bar{u} be in \mathcal{J} . From this point on, the arguments of Rickart and Dieudonné yield the final result.

74 pages. \$1.00. MicA54-1804

MINERALOGY

SIGNIFICANCE OF CLAYS IN SOUTHEAST MISSOURI LEAD ORES

(Publication No. 8604)

Donald Frank Beaumont, Ph.D.
Columbia University, 1953

Unusual, black clay layers in many places associated with massive, blanket-type galena ore in the southeast Missouri "Lead Belt" have been studied to determine their origin, mineral relationships, and effect in localizing mineral precipitation from solution. The relationship of these black clays to other argillaceous materials found in the ore bearing formation also have been investigated.

Separation of the fine, mineral constituents of the black clay layers has involved sizing, elutriation, heavy liquid separation, dispersion, and flocculation combined with centrifuging. The finest material (minus 300 mesh) has been identified by X-ray diffraction and optical data as a mixture of illite, adularia, and fine marcasite. The coarser fractions consist of detrital fragments of alkali feldspar, porphyry, and quartz in addition to marcasite, galena, and sphalerite.

Study of the lithic, dolomite units associated with black clay layers indicates that many have resulted from different depositional processes rather than from hydrothermal alteration as has been suggested previously. The effects of dolomitization are widespread and in some cases minute vugs have been developed in the rock. Thin sections of partially dolomitized limestone appear to indicate that dolomitization is a recrystallization process and that the cavity effect possibly represents the reduction in volume.

Prior to this study, black clay layers were believed to be the insoluble residue resulting from the removal by solution of portions of a dolomite bed, but it now seems more likely that they are primarily depositional. The depositional processes accounting for the clay layers are not understood fully but appear to be related to intraformational unconformities in the lower part of the Bonnetterre formation and to the existence of adjacent, pre-Cambrian porphyry knobs.

The effect of diagenetic, plastic deformation within the black clay layers also have been recognized. Further modifications, usually tending to accentuate pre-existing structural features, probably have been produced by epigenetic solution of carbonate material.

The location of many galena ore bodies immediately above black clay layers appears to have been due primarily to solution of dolomite and substitution of galena, i.e., replacement at this interface. Solution probably was controlled by the following factors: 1. the location of the black clay layers marginal to the more permeable areas of dolomite; 2. the existence of a chemical contrast, possibly of pH, between hydrothermal solutions below the clay layer and solutions in the overlying dolomite; and 3. the physical nature of the clay layer which, perhaps, facilitated the lateral movement of hydrothermal solutions toward the more permeable dolomite areas. If the movement of solutions occurred within the clay layer, the increased volume of solution brought into contact with the overlying dolomite may have been responsible for the ore. If, however, the clay layer was relatively impervious to fluid flow, the ore may have been implaced as a result of differential diffusion of the hydrothermal solution through the layer. Permeability tests will help to solve this problem.

74 pages. \$1.00. MicA54-1805

MUSIC

OPEN-AIR MUSIC OF THE BAROQUE: A STUDY OF SELECTED EXAMPLES OF WIND MUSIC

(Publication No. 8778)

Charles Warren Bolen, Ph.D.
Indiana University, 1954

The purpose of this study was twofold: (1) to investigate open-air activities of the Baroque period that utilized music, (2) to transcribe and arrange this music, if available, for modern performance.

The types of open-air entertainment that utilized instruments in the Middle Ages and Renaissance were varied, but the most important were ecclesiastical and secular dramas, processions, tournaments (which included both the tourney and the joust), coronations, hunting expeditions, and journeys. Although little of this music is extant, evidence from diaries and engravings indicate that trumpets and drums were the most frequently used instruments.

The most extravagant of Baroque open-air entertainment was the equestrian ballet, which originated in Italy and utilized features of the tournament. The first equestrian ballet occurred when music was added to the tournament to provide an accompaniment for the uniformly stepping horses. The ballet was divided into two parts: the first represented an allegorical drama such as an opera; the second part was the equestrian ballet proper.

It was customary for instrumental music of the equestrian ballet to be composed by someone other than the composer of the opera. Composers known to have written music for the accompaniment of these ballets were Georg Christoph Strattner, Johann Heinrich Schmelzer, and Ercole Bernabei. Sponsored by wealthy nobles, these ballets were given to celebrate joyous occasions: a marriage, the birth of an heir, to honor a foreign dignitary, or to commemorate a coronation.

French equestrian ballets, known as carrousels, used many competitive forms common to tournaments. The most famous of all German equestrian ballets were written by Schmelzer. Two have survived, *La Contesa dell' Aria e dell' Acqua*, 1666, and *La Germania esultante*, 1667. Dance forms, including the *allemande*, the *saraband*, the *courante*, the *folia*, and the *gigue* accompanied the intricate steps of the mounted horses. All steps, including curvets, caracoles, and voltes, were executed with great precision and were performed according to choreographic design.

In the Middle Ages *Zinken* or horns were sounded from towers to warn the citizenry of an attack or fire. Soon after the Reformation, tower musicians performed morning, noon, and night to remind the townsfolk that their prayers were due and to announce special events such as a birth or signing of a treaty. By the middle of the seventeenth century *cornetti* and

trombones played four and five part settings of music written for performance from a tower.

The extant tower music is limited to four composers, Johann Pezel, Gottfried Reiche, Johann Phillip Krieger, and Johann Georg Christian Störl although other seventeenth century composers may have had some of their instrumental works performed in a tower.

Many miscellaneous open-air activities made use of wind instruments: Military Activities, Water Festivals, Sham Naval Battles, Cavalcades, Lord Mayors' Shows, Fireworks, Ice Festivals, and Activities of Gleemen who provided instrumental accompaniment to animal tourneys.

Only binary and ternary forms are found in the open-air music of the Baroque period. Some of binary pairs are identified as dances and combined into suites. However, the regular order, as first used by Froberger and continued by others, has not been adhered to by open-air composers. Harmonization has been limited mainly to triads, a few dominant sevenths, and no altered chords. Fanfare intervals (fourths and fifths) have not appeared as frequently as might be expected.

The distinguishing factor of open-air music is the scoring which is largely for trumpets or *cornetti* and trombones.

Arrangements and transcriptions of open-air music in this study include two equestrian ballets and tower music of Pezel, Reiche, and Störl.

276 pages. \$3.45. MicA54-1806

AN EXPERIMENTAL EVALUATION OF TWO METHODS OF TEACHING MUSIC IN THE FOURTH AND FIFTH GRADES

(Publication No. 8474)

Carl Bertil Nelson, Ph.D.
University of Minnesota, 1954

Surveys have shown that instrumental music currently plays a minor role in the general music education of the children in American elementary schools. This study was undertaken to secure reliable objective data concerning the relative value of a course including vocal and instrumental music as compared to one including only vocal instruction.

The pupils selected for the study were all the children in the two fifth and two fourth grade classes of the Concord School, Edina, Minnesota, for the school year 1952-53. At each level, one class was selected by a random process to serve as a control group and the other as the experimental group. The number in each class was twenty-six; thus, the entire study involved 104 children. It was found that the sample should be considered above average in a socio-economic sense; the majority of the pupils' fathers

ranked high on the Minnesota Occupational Scale. No significant difference was shown between the experimental and control classes with regard to the amount of private music instruction prior to and during the study. Finally, the sample was found to be representative of Edina fourth and fifth grade pupils of earlier years, by using the criteria of grade point average and I.Q.

The length of the experiment was twenty-five weeks. During this time the control groups were subjected to the conventional vocal music instruction while the experimental classes alternated daily between vocal and instrumental training. The amount of time for music instruction for all four subgroups was held constant: five thirty-minute periods per week. The investigator did all the music teaching for this school year.

The instrumental training was effected by organizing the experimental classes into conventional concert band groupings. Instruments used were woodwinds, brass and percussion; all equipment, supplies and instruments were furnished by the author.

The criteria used to determine the relative worth of the experimental approach were two achievement tests of music reading skills, constructed by the researcher, and the Keston Music Preference Test. These tests were administered before the experiment began in the fall of the school year, and again in the spring, after the study was completed. Other data collected were reading comprehension scores, I.Q. and grade point averages. However, it was found, by computing the standard partial regression coefficient for each independent variate on the dependent variates for each subgroup, that only the pretests of the criteria had any significant relationship to the final results.

The application of the analysis of variance and covariance to the final Keston scores revealed that the experimental groups preferred "better" music than the controls. The difference was statistically significant at the one per cent level. With regard to music reading skills, it was apparent that the fifth grade children profited more from the experimental treatment than the fourth grade pupils. The differences, in this case, were significantly different at the fifth grade level, but not at the fourth.

A questionnaire sent to the parents of the children showed that the parents felt the experimental treatment was acceptable to them and indicated, in some ways, they felt it was better than only vocal instruction. According to a ranking of their school subjects in order of preference, the children in the experimental classes also appeared to like music more than did the subjects who were trained solely through the medium of the voice. This finding was statistically significant at the one per cent level.

It was concluded that many problems in connection with a program of this type need solution.

However, the findings of this study indicate the superiority of a vocal-instrumental program over vocal training alone in the musical growth of children.

305 pages. \$3.81. MicA54-1807

BAND WORKS OF TOMMASO VENETTOZZI EDITED AND RESCORED

(Publication No. 8376)

John Thomas Venettozzi, Ph.D.
Florida State University, 1954

The role played by the small community bands in the history of American music is one that has been almost completely neglected in the studies of the evolution of American musical culture. By far the most important small bands were those whose members were of Italian birth and training. Numerous Italian bands flourished in America in spite of limited community support and were valuable contributors toward the musical growth of the societies in which they functioned. In many instances they supplied the only music available to the general public.

Among the most musically productive of Italo-American band-leaders was one Tommaso Venettozzi, who, from 1911 to 1930, was conductor of the Banda Bianca of Utica, New York. Venettozzi's unpublished scores were acquired shortly after his death in 1940. The scoring of these compositions ranges from a mere basic guide to a carefully worked out instrumentation.

It is the purpose of this study to rescore and edit the representative band works of this pioneer in the development of band music in America; to present a history of the Italo-American band movement as a background to the music of the period; and to explain the editing procedures and problems encountered in preparing the music for modern bands.

The music, which consists of four symphonic marches in the Italo-American band style and three larger works suitable for concert band, have been scored for the following instrumentation: Woodwinds: Flutes, I, II; Oboes, I, II; Eb Clarinet; Bb Clarinets, I, II, III, IV; Alto Clarinet; Bass Clarinet; Alto Saxophones, I, II; Tenor Saxophone; Baritone Saxophone; Bassoons, I, II. Brasses: Cornets, I, II, III, IV; Eb Alto Horns, I, II, III, IV; Baritones, I, II; Trombones, I, II, III; Bases, I, II. Percussion: Bass Drum; Snare Drum; Cymbals; Triangle; Tambourine; Castanets; Bells.

The edited and recorded works of Tommaso Venettozzi should provide not only material of historical significance in American music, but also serve to enrich the present repertoire of American bands.

294 pages. \$3.68. MicA54-1808

PHILOSOPHY

THE DOCTRINE OF CONTRARIETY IN ARISTOTLE'S PHILOSOPHY OF PROCESS: AN ESSAY ON ARISTOTLE'S METAPHYSICS OF DISTRIBUTIVE BEING

(Publication No. 8596)

John Peter Anton, Ph.D.
Columbia University, 1954

The main theme of the dissertation is to demonstrate that Aristotle's view on Process and its understanding rests upon the premise that every process, in so far as it is determinate, is delimited by two extremities — a pair of contraries.

The term "process" as used by Aristotle, has in its most general meaning two applications: one for the eternal cyclical processes, and another for linear movement, the latter being characteristic only of individual substances subject to generation and destruction. This distinction, therefore, has limited our inquiry to linear processes, to which alone the notion of contraries is related.

The setting of our inquiry. Since we are concerned with process, it became necessary to relate substance (ousia) to nature. The Aristotelian division of the Speculative Sciences has set forth the field of Being to which contrariety applies. Then, excluding mathematical objects, divine objects, and Nous, it was found that contrariety is applicable only to things in process in the sublunary level. Here "being" is taken in the distributive sense. Yet, since the aim of First Philosophy is to study the first principles and generic traits of all being, it also studies the contraries, for they are taken to be principles. Thus, this essay deals with a genuine metaphysical problem in the Aristotelian tradition.

Historical antecedents and reconstruction of contrariety. Aristotle's denial of the independent existence of the Platonic ideas became the basis for a new approach to the problem of contraries. Plato, because of the inadequacies of the dialectical use of contrariety, did not see the essential features of this concept and its primary role in metaphysics. The pre-Socratics used the contraries exclusively in connection with the construction of their cosmologies and their theories of elements. Aristotle rejected the dialectical and cosmological uses of contrariety, but maintained it, though without much consistency, in his own stoichiology. His original contribution, however, lies in his use of contrariety for an ontological analysis of process.

The various intricate aspects of Aristotle's metaphysics of process from the point of view of contrariety are presented. The main argument is that contrariety is neither a substance nor a process; nor is it subject to process and change. By virtue of the priority of substances which are loci of changes and processes, contraries are distinctive traits marking the termini of change. Thus, by delimiting process,

contraries constitute the conditions for its intelligibility. Process is principally understood in reference to four central categories (substance, quality, quantity, and place), and it is shown that contrariety is present in all these genera of predication.

Aristotle accepted the contraries together with the subject-in-process as the three necessary principles for any analysis of process. This led him to the formulation of a prime contrariety whose terms are Form and Privation. This prime contrariety throws further light upon the distinction between actuality and potentiality, the relation between privation and the meaning of matter, and finally, potentiality and the various types of matter.

Contrariety, being a condition for the intelligibility of process, is therefore, necessarily related to language and the articulation of differences. Thus, contrariety is placed in its proper linguistic context as one of the four types of opposition, and their relations and differences are discussed.

The conclusion is that since truth and falsity are not understood apart from statements about things that are, in some sense, contrariety as forming the termini of every determinate process is the foundation for the law of non-contradiction which, according to the Aristotelian philosophy of truth, is the foundation for all precision of meaning.

218 pages. \$2.73. MicA54-1809

ABRAHAM IBN DAUD AND THE BEGINNINGS OF MEDIEVAL JEWISH ARISTOTELIANISM (with particular reference to the concept of substance in the EMUNAH RAMAH)

(Publication No. 8597)

Milton Arfa, Ph.D.
Columbia University, 1954

This dissertation is a critical study of the physics and metaphysics of Abraham ibn Daud (c. 1110-c. 1180). In medieval Jewish philosophy ibn Daud occupies a crucial position between ibn Gabirol, the greatest Jewish Neoplatonist, and Maimonides, the greatest Jewish Aristotelian. Ibn Daud's treatise, the Emunah Ramah, affords a cross-sectional view of medieval Jewish philosophy at the point where on the one hand it has rejected Neoplatonism but has not yet freed itself of many of its fundamental doctrines, and on the other hand has espoused Aristotelianism but has not assimilated the full meaning of its world outlook. To make matters more complicated, medieval Neoplatonism is full of Aristotelian notions; similarly, the early medieval view of Aristotle attributes to him many Neoplatonic notions. The mainspring of this study is the problem of distinguishing between the crosscurrents of Aristotelian Neoplatonism and

Neoplatonic Aristotelianism in ibn Daud's philosophy. The thesis of this dissertation is that the solution to this problem lies in ibn Daud's notion of substance and his polemic against ibn Gabirol's views on this subject. Hence, ibn Daud's notion of substance is studied in some detail with a view to clarifying the philosophical issues that were at stake in the transition from Neoplatonism to Aristotelianism which this treatise reflects.

The first part of this work treats of ibn Daud's views on substance, accident, essence, and existence, laying the groundwork for the second part in which ibn Daud's proofs for the existence and substantiality of the different substances — namely, corporeal substances, matter, form, soul, the Active Intellect, the Intelligences, and God — are critically examined.

Special attention is given to ibn Daud's quarrel with ibn Gabirol over the question whether the selfsame thing can be both a substance and an accident. Ibn Gabirol holds that some things are substance and an accident. Ibn Gabirol holds that some things are substance in one respect and accident in another respect, while ibn Daud maintains that "in every place and in every respect substance is substance and accident is accident." For ibn Daud, since the substance of a thing determines what it is, the selfsame thing cannot both be and not be a substance without being and not being itself simultaneously, which is absurd. In ibn Gabirol's system, however, the terms substance and accident do not refer to the internal constitution of individual things but to their external relations to each other. It is the relation of things to one another in the hierarchy of emanated substances which determines their relative self-sufficiency and hence the sense in which they are either substances or accidents. The ontological viewpoint of ibn Daud is contrasted with the cosmological viewpoint of ibn Gabirol, and the relation of the former to Aristotelianism and the latter to Neoplatonism is brought out.

In the second part of this work, it is maintained that ibn Daud's proofs for the existence of the different incorporeal substances are based more on analogies between the corporeal world and the incorporeal world than they are on the Aristotelian theorems of motion which are ostensibly supposed to demonstrate these analogies. Ibn Daud's proofs are compared with those of Maimonides, and the former's contribution to the developments of medieval Jewish Aristotelianism is evaluated. This part of the dissertation concludes with a discussion of ibn Daud's cosmogony. His rather inept attempt to syncretize Avicennian and Jewish cosmogonic notions is brought out through a comparison with Maimonides' treatment of the problem of creation. The dissertation concludes with a discussion of ibn Daud's theory that man is an epitome of the universe.

169 pages. \$2.11. MicA54-1810

SANTAYANA'S THEORIES OF ART AND AESTHETICS: AN INTRODUCTORY STUDY

(Publication No. 8599)

Jerome Ashmore, Ph.D.
Columbia University, 1954

Santayana's thinking in the field of art theory and aesthetics divides into four parts. Three of these are distinctive and major, being concerned respectively with aesthetic experience, criticism of poetry, and rational art; the fourth is supplementary and heterogeneous, consisting of relevant subject matter that in general extends the comprehension of the three main parts. The dissertation attempts a constructive exposition of the structure of these four parts, stressing analysis of the theoretical position entailed in each.

Santayana's doctrines of aesthetic experience depend on an associationist, functional psychology, conjoined with a hedonistic value theory, in the setting of a mechanistic universe. Beauty is a value experience, non-cognitive and constituted by an objectification of pleasure. The experience presupposes a sense of beauty within the percipient. Beauty occurs in the presence of elements of phenomenal objects distinguishable as sensible material, abstract form, and associated qualities, although beauty itself has no elements. The factor of sensible material involves the perceptual processes of sight and hearing, together with the organism's vital impulses; the factor of form involves a perception of a synthesis of sensible elements separately apprehended; the factor of expression involves the association of an absent object with the experience of the presented object. Under all three conditions, considered both individually and in aggregate, a process originating in desire becomes pleasure; the act of objectification follows and the pleasure becomes an illusion of a quality of a thing. Thereby pleasure becomes beauty.

Santayana's main doctrines of criticism of poetry have three aspects: first, a psychological foundation wherein understanding is akin to imagination; second, a claim of actual identity between poetry and religion; third, an assertion of a scale for comparing poetic accomplishment. Understanding is a species of imagination and continuous with it. Both are prophecy. In the dimension of an imaginative construction poetry and religion are substantially identical, although nominally distinguishable. Poetry attains its highest rank when it is moral in character, cosmic in scope, and profound in insight. On its lowest level poetry is principally sensuous. Between the two it is romantic. But on every level the source of poetry is emotional experience.

Santayana's theory of art considers the interaction of the organism and its environment as the original basis of art products. Impulse and ideation conspire to give man ideas to apply to his environment. Reason acts to indicate an harmonious organization of diverse factors in experience, to represent an ideal moral objective, and to control the activity required to approach this objective. Organism and environment each have plasticity and continuously affect each other, at first

spontaneously in the mode of play, and subsequently according to a moral ideal with consideration for utility. The product of the interaction qualifies as art if it has utility, if the producer is aware of the utility, and if the procedure constituting the interaction is transmissible, by either imitation or instruction. Continuous production of art alters human environment and the alteration signifies progress. The art to be produced in the future is expected to maintain continuous interaction with the art of the past, and, assuming reason as a guide to the process, the consequence is continuous improvement of the conditions of human existence. In fulfilling the above conditions art is rational and an indispensable part of the Life of Reason.

Santayana's later writing contains no new views of art or aesthetics.

The dissertation maintains that Santayana produced a more self-sustaining and comprehensive aesthetic theory than he ever acknowledged and that this theory emerged from an original unity of conception without alteration by progressive criticism or otherwise. 218 pages. \$2.73. MicA54-1811

HOBBS' ACCOUNT OF MIND AND KNOWLEDGE

(Publication No. 8607)

William Giles Boardman, Ph.D.
Columbia University, 1954

The writings of Thomas Hobbes (1588-1679) on the general subject of human nature and knowledge show that Hobbes developed, apparently originally, a rudimentary logical empiricism. This is the significance of his viewing experience and arbitrary definitions of names as the two sources of all knowledge.

The kind of knowledge that Hobbes was particularly interested in was (to stay with contemporary terminology) scientific knowledge. Initially, he defined this knowledge, by contrast with experience, as characterized by universality. Interpreting Euclidean geometry as knowledge of a natural subject matter and Euclid's demonstrations as logical deductions from definitions of names, Hobbes inferred that science represented a combination of experience and linguistic knowledge. Names converted experience to science.

Subsequently, Hobbes' scientific interest focused on the mechanical explanation of sensible effects in the nascent physical science of his day. But Hobbes did not share Descartes and Galileo's interest in the mathematical analysis of effects, and viewed the new science as yielding nothing more than hypotheses as to the production of effects by the motion of particles too small to be seen. When he undertook to develop a comprehensive method for the new science in competition with Descartes, he reconstructed Bacon's method for this purpose; and he justified the hypothetical results by insisting in Baconian terms (perhaps unrealistically, given the inaccessibility of the causes) that knowledge of possible causes was as useful practically, for the production of effects, as knowledge of actual causes.

Hobbes did not submit the first principles of the new science to critical examination in terms of his empiricist analysis of knowledge; but neither did he acknowledge a rationalistic basis for those principles. He never ceased to interpret scientific demonstrations as purely logical exercises based on arbitrary definitions, and expended much effort on the requirements to be met for such demonstrations to serve as the vehicle for mechanical explanations. Hobbes' discussions of supernatural matters and his objections to Descartes' Meditations exhibit the same empirical philosophy.

Hobbes extended the new physical science to the human mind, explaining sense experience as the result of mechanical action on the organs of sense, and viewing it, analogically, as no more possessed of cognitive value than dream experience, or the stars seen after a blow on the head. From this beginning he went on to account for all ideational experience, even whole trains of images, as repeated sense experience, such experience reflecting the persistence and gradual diminution of the motions involved in sensation.

Close study of Hobbes' several presentations on these points shows that he never reduced psychical to physical effects. Contrary to a prevalent opinion, therefore, he did not push mechanical explanation so far as metaphysical materialism. For some time he did not see that his explanation of sense entailed a non-presentative interpretation of perception. When he did adopt the representative interpretation, he never used that result to invalidate the premises by which it had been reached; that is, to question the scientist's view of nature as so many bodies possessed of a minimum of properties — magnitude, figure, motion, and rest — together with the non-physical effects experienced in certain of those bodies. Hobbes' application of the principle of inertia to explain whole trains of thought involved no recognition of an associative mechanism and accounted for no links or transitions between distinct experiences. It was an insufficient explanation of the trains of thought that he cited.

The entire history of Hobbes' views on mind and knowledge receives similar detailed commentary. The consideration of those views extends topically to the nature and significance of language and to Hobbes' analysis of his own political philosophy as a body of knowledge. 138 pages. \$1.73. MicA54-1812

ORDER AND HUMAN VALUE

(Publication No. 8781)

Douglas Carmichael, Ph.D.
Indiana University, 1954

The introduction presents a theory of value and certain metaphysical views presupposed by it. Men establish the human values of things by choosing them, tacitly or deliberately. Choice may operate mentally without leading to action. Knowledge and comparative liking of a thing must precede its selection. Choice depends on the suitability of the object to the purposes of the agent. The facts of choice suggest five modes

of being: "spiritual," physical, mental, potential, and universal. The entities open to experience are actual or ideal. Actual entities are distinguished by their possession of power, which takes various manifestations. The self has several aspects, including will and intellect. The will has limited freedom.

Order is relatedness, which is present in all empirical entities. Any order is part of a more inclusive one. Actual orders have real "foci." Any order may have various apparent "foci." Conceived as a quality of entities, order admits of degrees, depending on the entities' complexity, unity, and extensiveness. Harmony is a weaker form of unity, autonomy a determinant of complexity. These criteria may sometimes conflict and are not all quantitatively measurable.

Disorder is merely comparative. The order of a situation is increased by ordering. Most ordering is disorderly, involving the destruction of previous orders. Orderly ordering is possible only through certain types of growth.

Neither perfect order nor perfect disorder exists empirically and universally, but they may be schematized with reference to the several criteria mentioned above. Countless particular orders exist, including social orders, which, unless absolute, seem generally lower than the orders of their members. The self perceives and creates orders through reason, imagination, and will. Ideal orders serve as patterns for creation of actual ones. The self has its own order and is a part of inclusive orders.

Choice depends on the mutual adaptability of the particular orders of agent and object, as conceived by the agent. Men rarely choose maximum order; either they try impractically to become real foci of their chosen orders, or they prefer ordering (action) to order, which can only be contemplated. Hence value does not depend on order. Ordering is justified, however, because without it maximum order cannot be achieved for contemplation.

Obligation is the power exerted in choice situations by previous long-range choices. The choice of life, as prerequisite to all other human choices, exerts the strongest obligation. Life is primarily growth. Human life implies growth in reason, the outstandingly human trait. Personal life implies growth in all one's individual capacities. The fullest personal and human life both require maximum development of reason and hence of order, which is the product of reason. Thus there is a hypothetical obligation to choose maximum order. Neither maximum life nor order need be chosen. Worth is conduciveness to order.

The general theory is classified as a hypothetical eudaemonism based on a descriptive hedonism. The theory has metaphysical parallels in Plato, Aristotle, Leibniz, Kant, Whitehead, and existentialism. In respect to worth it shows similarities to hedonism, utilitarianism, "moral sense" views, pragmatism, and Aristotle.

262 pages. \$3.28. MicA54-1813

THE LOGICAL STRUCTURE OF MORAL REASONING

(Publication No. 8447)

Héctor Neri Castañeda, Ph.D.
University of Minnesota, 1954

The introductory chapter attempts to meet the emotivistic challenge as formulated by Ayer and Stevenson. It is shown that: (1) there is a certain logicity in commands; (2) although normative sentences are like commands in some respects, they are logical in a fuller sense; (3) (non-psychological) rules of normative inference are presupposed by or at least compatible with Ayer's or Stevenson's analysis of 'ought.' It is pointed out that even if Ayer were correct, which he is not, in claiming that we do not dispute about values or obligations, our systematization shows how we could proceed to carry on such disputes.

An examination of some recent views on imperative and normative language leads to the formulation of twenty-one criteria to be satisfied by an adequate theory of norms. For example, normatives constitute a type of sentence irreducible to either indicatives or imperatives. Like the former, they are either true or false and can be premises or conclusions in inferences. Like the latter, they are not used for descriptive purposes but to influence behavior. This behavior-evoking function is such that the acceptance of "I ought to do A" (i.e., the sincere unconditional belief that I ought to do A) moves me to do A. Normatives belong to the (object-) language which also contains indicatives and imperatives; both universal and singular normatives belong to the same logical level — if the former can be formulated in a functional calculus lacking quantification over predicates, then the latter can also be formulated therein. (Cf. Hare's view.)

A formal system N^* is proposed which satisfy those criteria. The irreducibility of imperatives to indicatives is construed as a different type of predication; and that of normatives as the formation of a special kind of indicatives out of imperatives by means of the primitive modal imperative-indicative operator 'ought.' N^* includes special axioms and a rule for normative inference, but imperative inference is not allowed.

Having clarified the notion of norm, that of moral norm is taken up. Two kinds of moral norm are distinguished. One, the ethical norm, presupposes an (ethical) order or ethos of all nonethical norms that affect the individuals constituting the universe of discourse of the ethical system. The ethical norms prescribe the doing of the action which is both possible at the moment and highest in the ethos provided it belongs to a selfconsistent (nonethical) subsystem; if all nonethical norms prescribing an action are inconsistent, the latter is not ethically prescribed or forbidden. Thus, ethical reasoning may be said to be deontological (for it requires the general principles of normative and primitive ethical and nonethical 'ought's), categorical (for the ethos that determines an ethical system is primitive in it), and nonnaturalistic (for the ethical norms cannot be justified in the ethical system they belong to).

The second level of moral reasoning belongs to the metalanguage of ethical systems. Here seven principles of moral ordering are formulated, which embody the ideals of eudaemonism, altruism and justice in the moral ranking of actions. Since norms are ranked according to the moral worth of the actions they prescribe, we have here a formulation of the ideal of morality. The second kind of moral norm prescribes actions leading to a change in the current ethical system when its *ethos* is known to be immoral in this narrow sense or when certain circumstances are present. (Three types of moral errors in ethical systems are considered.) This kind of moral reasoning is still deontological and categorical, but based on a naturalistic account of moral value. This view is a metalinguistic nonhedonistic utilitarianism that does not directly prescribe the maximization of happiness. 254 pages. \$3.18. MicA54-1814

L'ASPECT MÉTAPHYSIQUE DU MAL DANS
L'OEUVRE LITTÉRAIRE DE CHARLES
BAUDELAIRE ET D'EDGAR ALLAN POE

(Publication No. 8521)

Arnolds Grava, Ph.D.
University of Nebraska, 1954

Adviser: Dr. Boyd G. Carter

The purpose of this thesis is to investigate the metaphysical category of evil which lies at the basis of what is usually called the 'satanism of Baudelaire' and the 'spirit of perverseness' in the case of Poe.

The first chapter deals with the problem of affinity between Poe and Baudelaire. Our analysis reveals no direct personal influence but does show elements incorporating a common literary atmosphere of which the obsession of the Macabre is perhaps the most important. The Macabre is intimately related to the concept of Beauty through the concept of the Bizarre. The latter is both an esthetical and a numinous category.

In the second chapter are shown the essential characteristics of the numinous experience as found in the works of Poe and Baudelaire. The numinous experience of Poe manifest itself without moral differentiation between Good and Evil; that of Baudelaire is characterized by a sharp antithesis between the two moral concepts.

In the works of both the mutual relationship between the concepts of the Beautiful and the Ugly is grounded upon the concept of the Bizarre, the constitutive elements of which possess the quality of being interchangeable.

The third chapter gives a detailed analysis of the ontological foundation and characteristics of the concept of Evil. For Poe, evil is implied as a secondary cause in the original unity of the Absolute Being. Any deviation from the latter entails necessarily imperfection and evil. Similarly for Baudelaire, Creation presupposes the metaphysical necessity of evil. The detailed analysis of the Baudelairean concept of

original sin reveals certain non-Christian elements, along with a nostalgia for the personal God of his Catholic childhood.

The essential characteristic of Evil manifests itself intellectually or sensually as a pathological function. The intellectual form of perverseness pre-occupies Poe, whereas Baudelaire is more concerned with the sensual aspect of perverseness. Both forms envisage degrading disintegration which culminates in the irrationality of the numinous category.

For Poe, God and the human soul are one and their essence is the numinous irrationality. Therefore Poe may be considered a strict monist. Baudelaire revolts against an omnipotent God as a consequence of positing the problem of Evil from the standpoint of moral responsibility.

The fourth chapter presents a critical evaluation of both authors based upon some fundamental notions of Whitehead's philosophy of organism.

Both authors reveal a certain number of intuitions which correspond not only to Whitehead's metaphysical concepts but also to some basic principles of modern science. Both however have also been victims of the fallacy of misplaced concreteness. The major inconsistency of Poe is his monistic position which leads logically to a whole series of contradictions, such as the creation 'ex nihilo' and the identity of good and evil within God. Baudelaire's major inconsistency is the fluctuation between monism and dualism. Both authors have failed to see that the notion of the necessary limitation of God provides the only defensible basis for a relatively consistent solution of the problem. Nevertheless, Baudelaire has come nearer to the Whiteheadian solution of the problem than Poe in formulating consciously the irreducibility of Intelligence to the irrational forces of Creativity.

For Whitehead, neither aspect of Reality (God, Universe, Creativity) is omnipotent. There is a constant mutual interaction between them the result of which is the perpetual 'becoming' towards novelty. Since all actual entities are self-creative, evil is the fragmentary purpose disregarding the eternal vision. The main function of Intelligence or God is to prevent the irrational forces of Creativity from degenerating into a maelstrom of self-destruction and to preserve the realm of values. 230 pages. \$2.88. MicA54-1815

THE PHILOSOPHIC CRITIQUE
OF NATURALISTIC ETHICS

(Publication No. 8438)

Rollo Leroy Handy, Ph.D.
University of Buffalo, 1954

This dissertation is concerned with the criticisms of naturalistic theories of ethics made in recent English and American moral philosophy. Three groups of critics are considered: idealists, intuitionists and allied writers, and emotivists. The dissertation is divided into two main sections.

The aim of the first section is to make clear the

distinguishing characteristics of a naturalistic theory of ethics. The descriptions of such theories by non-naturalists are discussed, with emphasis upon the misleading character of some of the critics' statements. The following criteria are arrived at as defining a naturalistic theory: (1) Morality is regarded as humanistic, (2) Ethical propositions are cognitively meaningful, (3) Ethical propositions can be true or false, and (4) Ethical terms can be defined descriptively. The last three criteria are meta-ethical, while the first is concerned with the nature of morality. Naturalism is distinguished from idealism by (1), from emotivism by (2) and (3), and from intuitionism by (4).

Four prominent writers on ethics who are usually regarded as naturalists are considered: the early evolutionists, Spencer and Huxley; and two contemporary writers, Perry and Dewey. This illustrates how seriously naturalistic theories have been misrepresented by some critics. The extent to which the theories of these four writers fulfill the above criteria is also discussed.

The second main section deals with alleged fallacies and errors of naturalism. The "naturalistic fallacy" is analyzed; it is concluded that it is not a genuine fallacy and that a naturalistic definition of "good" is possible. A suggested definition of "good" in terms of the satisfaction of human needs is discussed, as well as the compatibility of such a definition with the theories of Dewey and Perry.

The assertion that the naturalist illegitimately derives obligation statements from factual statements is analyzed, and the relation of this "fallacy" to the "naturalistic fallacy" is considered. "To derive an 'ought' from an 'is'" may be construed in several ways, and various meanings are discussed. It is also argued that the naturalist can account for "ought" just as adequately as he can for "good." Statements in the so-called "relative obligation" form are defended: "If a, b, c, . . . are to be achieved, x ought to be done." Since a, b, c, etc. are in the factual realm, in some cases it is legitimate to "go from an 'is' to an 'ought.'" "

Several different descriptions or definitions of the "genetic fallacy" are considered. It is argued that this may be a real fallacy (e.g., if either validity or truth is confused with origin and history), but that there is no necessity for the naturalist to commit such a fallacy. Some writers attempt to extend the meaning of the "genetic fallacy" so far that the typical naturalist commits it; but it is argued that in such instances the alleged fallacy is not a fallacy. Those naturalists who use the genetic method need not commit the genetic fallacy, and this method is important in estimating the total significance of a moral rule or of an institution.

The emotivist contention that the naturalist erroneously regards the meaning of ethical terms as descriptive, although that meaning is basically emotive, is considered. It is argued that emotive meaning is not central to the significance of ethical terms and that the naturalist can account for the emotive force of ethical judgments.

The intimate relation of ethics and the special

sciences, on the naturalistic view, and the resulting advantages to ethics, is discussed. It is concluded that the recent Anglo-American critique of naturalistic theories of ethics is not well-grounded, and that naturalism does offer the hope of a reasonable ethics for man.

334 pages. \$4.18. MicA54-1816

THE ROLE OF DETERMINATE AND DETERMINABLE MODES OF APPEARING IN PERCEPTION

(Publication No. 8389)

Charles Mason Myers, Ph.D.
University of Michigan, 1954

It is the purpose of this study to show how the fact that a whole can be perceived with very little awareness of the specific parts constituting that whole can be understood in terms of modes of appearing without introducing any concepts which are in conflict with an adequate phenomenology of such an experience. It will be argued that the gestalt-like perception of an object as a whole can be interpreted as involving a concomitance of determinate and determinable modes of appearing and that such an account of experience has the virtue of remaining true to an adequate phenomenology of perception.

It will be shown how in particular the perception of space, the perception of motion, and the vagueness of certain experiences are more adequately dealt with in terms of the concomitance of determinate and determinable modes of appearing than from the point of view of the more traditional sense-datum theory. It is also argued that some seeming conflicts in attempts at phenomenological description are resolved when considered from the modal point of view developed in this study.

The first two chapters are concerned with the basic notions that must be made clear before the concept of a mode of appearing is developed. In the first chapter four basic notions are discussed: (1) our point of philosophical departure, (2) the distinction between experience and thing experienced, (3) the description of appearing, and (4) the notion of an ostensible physical object. The second chapter continues the discussion of basic notions by distinguishing the four following types of immediacy: (1) pre-analytical, (2) phenomenological, (3) genetic, and (4) logical. It is argued that the two former types are sufficient for our purposes and that the two latter types can be dispensed with.

The basic concepts having been presented the third chapter develops the concept of modes of appearing on this groundwork, and this is followed by an exposition of the determinate and determinable modes of appearing in the fourth chapter. The perception of a whole as involving a concomitance of determinate and determinable modes of appearing is illustrated and discussed. Following this the sixth chapter shows special applications of the modal view to the notion of perceptual vagueness and to the perception of space and motion.

The sixth chapter takes up some criticisms that might be brought against the present theory, and discusses the advantages of the present theory.

309 pages. \$3.86. MicA54-1817

EARLY INDIAN PHILOSOPHICAL NATURALISM

(Publication No. 8401)

Dale Maurice Riepe, Ph.D.
University of Michigan, 1953

We first conceived the possibility of this study in the summer of 1949 at the East-West Philosophers' Convention in Honolulu. As the sessions on Indian philosophy progressed it became a haunting question as to whether contemporary Indian philosophers were giving adequate attention to the naturalistic tradition in early Indian thought. It seemed to us that this phase of Indian philosophy had been carelessly disregarded by most philosophical scholarship.

The question then arose: to what extent was early Indian philosophy actually naturalistic in spirit?

In order to answer this question the following criteria for naturalism were used. (1) The naturalist accepts empiricism as one avenue of knowledge, although not necessarily the only one. (2) The naturalist does not believe that knowledge is esoteric, but that it can be discovered by ordinary mortals who will

take the trouble to look for it. (3) The naturalist believes that the external world of which man is a part is objective — it is not merely "my idea." (4) Naturalists believe that the world manifests order and regularity which cannot be changed by merely mental means or symbolic forms such as magic, sacrifice and prayer. (5) Naturalists reject supernatural teleology even if they believe in some kind of a supernatural such as the deists did. (6) The naturalist is essentially humanistic. Man is not simply a mirror of deity but an individual in his own right. The goal of man is to do what is proper to man.

After a brief examination of naturalistic tendencies in the Vedas and Upanishads the earliest systems of Indian philosophy are analyzed in detail: Carvaka, Theravada Buddhism, Jainism and Sankhya. These are examined for their epistemological, metaphysical and ethical naturalism.

The study concludes that early Indian philosophy is significantly naturalistic in temper and doctrine. Two of the four early Indian systems, Carvaka and Sankhya, are clearly naturalistic. The naturalism of Theravada Buddhism and Jainism is most pronounced in their metaphysical theory. Theravada Buddhism proves to be slightly naturalistic whereas Jainism is considered to be essentially non-naturalistic. Three of the four systems examined prove to be naturalistic rather than non-naturalistic, largely on metaphysical grounds.

333 pages. \$4.16. MicA54-1818

PHYSICS

PHYSICS, GENERAL

A STUDY OF SPECIFIC INTERACTIONS BETWEEN MACROMOLECULES

(Publication No. 8514)

William Lemoine Bade, Ph.D.
University of Nebraska, 1954

Adviser: Herbert Jehle

Certain phenomena, including the synopsis of chromosomes during meiosis and the self-duplication of genes in mitosis, indicate the existence of highly specific attractive forces between some biologically important macromolecules. From their comparatively long range and their extremely accurate discrimination between similar molecules, it appears that these forces must be a variety of van der Waals force due to the interaction between vibrating electric dipole moments in the two molecules.

In the investigation reported here, the molecules in question were represented as systems of coupled harmonic oscillators in equilibrium with a heat bath and coupled with one another by their vibrating electric dipole moments. Some theorems about the

general case were found, and the cases of one and of two oscillators per molecule were studied in detail. A particular system of two such molecules possessing maximal symmetry was chosen as a standard "undertuned" system with which all similar "detuned" or altered systems were compared. The change produced in the interaction force by a general small detuning of the standard system was calculated for the one- and two-oscillator cases. It was found that the interaction cannot be specific for models containing only a small number of oscillators.

In order to get an indication whether and under what circumstances the attraction can be specific when each molecule contains a large number of oscillators, the gain in specificity on proceeding from the one- to the two-oscillator case was calculated. It was found that this gain in specificity is not generally positive, but that it is positive for a pure detuning of the masses in one of the molecules, provided that the coupling parameter between the two oscillators in each molecule is negative and that the separation of energy levels is sufficiently large in comparison with kT . On the tentative assumption that these changes in specificity are similar to those arising on passage to much larger models, a set of conditions was suggested, such that members of a class of molecules

satisfying these conditions should interact specifically with one another. Desoxypentose nucleic acid molecules are believed to satisfy these conditions exactly; unbranched chain proteins satisfy them approximately. However, this interpretation of the results in the one- and two-oscillator cases should be regarded as highly speculative. The theory is at present far from being sufficiently advanced to permit giving a detailed account of the experimental facts. 106 pages. \$1.33. MicA54-1819

REACTIONS OF 370 MEV PROTONS WITH COBALT

(Publication No. 8605)

Emanuel Belmont, Ph.D.
Columbia University, 1952

Cross sections have been evaluated for the formation of various products resulting from the irradiation of cobalt with 370 Mev protons in the circulating beam of the Columbia University Nevis Cyclotron. The elements from titanium to cobalt are formed in greatest yield; total cross sections of the order of 50-80 millibarns have been found for each of these elements by interpolating values for stable isotopes. On the other hand, nuclei such as carbon and sodium are formed with cross sections of the order of 0.05 millibarn. These results are in accord with the hypothesis of nucleon-nucleon interactions leading to the loss of nucleons from the target by "knock-ons" followed by evaporation of particles from a spectrum of residual nuclei with a spectrum of excitation energy. The cross sections for the more probable events are in qualitative agreement with recent measurements on proton induced stars and with Monte Carlo and evaporation theory calculations. 75 pages. \$1.00. MicA54-1820

DENSITY MEASUREMENT IN SHOCK-TUBE FLOW WITH THE CHRONO-INTERFEROMETER

(Publication No. 8774)

John Edward Mack, Ph.D.
Lehigh University, 1954

The design, development, and testing of a new instrument — the chrono-interferometer — for transient flow measurements is described and an extensive set of measurements of gas density throughout shock tube flows is presented.

The interferometer employs the Michelson arrangement of optical components and is used on a 3.5 cm diameter shock tube of circular cross section. After passing through the shock tube, the light beam in one arm of the instrument combines with the beam in the other arm to produce a single fringe across the entire 1/8" diameter field. The resultant light intensity of the single fringe system depends upon the relative phase of the interfering beams; the light

intensity varies with the index of refraction, and hence with the gas density. A time record of the light intensity is recorded photoelectrically on an oscillograph. The instrument is best suited to the study of one dimensional flows without steep density gradients; its chief advantage lies in the absence of any essential limitation to the extent of a flow which it can record.

The time dependence of density in primary shock tube flows in nitrogen resulting from initial diaphragm pressure ratios of 2, 10, and 50 was measured at four channel positions and four chamber positions. Flows studied include cases in which the hot gas and the cold gas were each either subsonic or supersonic.

The flows studied are not adequately described by the ideal shock tube theory, although rough outlines of the ideally predicted regions of flow are evident. It has been found that (1) the gas density increases within the hot gas by as much as 50% of the density increase across the shock, (2) the cold front spreads out, eventually occupying a space along the tube equivalent to 60 tube diameters, and (3) the density decreases within the rarefaction in the chamber by only 80% of the decrease which would occur in the centered isentropic wave ordinarily assumed in the ideal shock tube theory. 119 pages. \$1.49. MicA54-1821

THEORY OF AN ELECTRON IN A MAGNETIC FIELD WITH APPLICATIONS TO THE MEASUREMENT OF THE GYROMAGNETIC RATIO OF THE FREE ELECTRON

(Publication No. 8380)

Harold Mendlowitz, Ph.D.
University of Michigan, 1954

The motion of a Dirac particle in a constant homogeneous magnetic field is studied by means of wave packets and also by considering the equations of motion of the operators in the Foldy-Wouthuysen representation. It is found that to a high degree of approximation one can consider the spatial and spin motions separately. The quantum mechanical space motion is in substantial agreement with the classical motion of a particle rotating about the magnetic field with the relativistic Larmor frequency. The quantum mechanical spin motion essentially behaves like a classical dipole precessing about the magnetic field with the relativistic Larmor frequency. When the radiative corrections to the electron's spin moment are considered, it is found that the precession frequency depends upon: the energy of the particle, the magnitude of the magnetic field, and the relative orientations of the particle's velocity and magnetic field. These results are utilized in extending the Mott theory of double scattering of electrons to include the case where a magnetic field intervenes between the two scattering events. Depending upon the relative orientations of the magnetic field and the initial beam and first scattered beam, the anomalous moment interaction affects the cross section in a way which should be detectable. This can be employed to measure the gyromagnetic ratio of the free electron. Depolarization

effects arising from the various kinds of small oscillations about the equilibrium orbits are considered, and the way that the depolarization affects the double scattering cross section is discussed in terms of the field and orbit parameters and the time between the two scatterings. This gives rise to certain restrictions on the field parameters and the number of revolutions between the two scatterings depending upon the accuracy that one wishes to measure the gyro-magnetic ratio. 159 pages. \$1.99. MicA54-1822

PHYSICS, ELECTRONICS & ELECTRICITY

ELECTRONIC AND STRUCTURAL PROPERTIES OF CONDENSED AROMATIC MOLECULAR SOLIDS, CARBONS AND POLYCRYSTALLINE GRAPHITES:

- I. THE ENERGY GAP IN CONDENSED AROMATIC MOLECULAR SOLIDS.
- II. STUDIES OF CARRIER CONCENTRATIONS IN CARBONS AND POLYCRYSTALLINE GRAPHITES.
- III. STRUCTURE AND GRAPHITIZATION OF FINE COKE PARTICLES AND OF THERMAL CARBON BLACKS.

(Publication No. 8439)

Edward Andrew Kmetko, Ph.D.
University of Buffalo, 1954

Spectra of condensed aromatic molecular solids (raw coke films produced by heating Cellophane) contain an intense absorption band which extends through the visible and terminates in the near infrared. The absorption limit shifts to longer wavelengths with increasing molecular size, i.e., increase in the maximum heat-treatment temperature, H . The dependence of the resistance upon temperature is approximated by the relationship for intrinsic semiconductors, $R \sim \exp E_g/2kT$, the activation energy E_g being roughly equal to the photon energy which corresponds to the absorption limit. When the treatment temperature exceeds about 600°C , however, the energy value obtained from the temperature dependence of resistance decreases with respect to H more rapidly than the value given by the absorption edge. Concurrently, an overall continuum appears which completely obscures spectra of films heated to above 700°C .

These results are consistent with the Mrozowski model for electronic processes in the condensed aromatics ranging from hydrocarbons to graphite. The features of this model are (1) an energy gap between the π - and conduction bands, the gap width steadily decreasing with crystallite size, and (2) the existence, in the π -band, of excess holes which result from trapping of electrons by peripheral carbon atoms left with unoccupied valence orbitals when the hydrogen and organic side groups are expelled during the initial heating in the range $600^\circ\text{C} < H < 1400^\circ\text{C}$.

Chemical oxidation of graphite in sulfuric acid is known to result in the introduction of HSO_4^- ions

between the planes and creation of excess holes in the π -band. In this work carbons heat-treated to various temperatures from 1400°C to 3000°C were chemically oxidized into bisulfates. In all cases conductivity increases and the thermoelectric power initially becomes more positive, these effects being greater in carbons having the larger crystallites. The temperature coefficient of resistance, initially negative for all samples, is unaffected by oxidation when $H < 2000^\circ\text{C}$, but changes and becomes positive in carbons for which $H > 2000^\circ\text{C}$. The Hall constant versus H for unoxidized carbons has a sharp positive peak at $H = 2000^\circ\text{C}$, drops to negative on both sides, and has a minimum at 1400°C . These results are in general agreement with the Mrozowski model according to which the Fermi level is depressed as a result of the creation of the peripheral electron traps. The trap concentration is maximum when devolatilization is just completed ($H = 1400^\circ\text{C}$). Therefore subsequent growth results in a rise in the Fermi level, the energy gap meanwhile decreasing. Carbons treated to below 2000°C thus are semi-metallic whereas those for which $H > 2000^\circ\text{C}$ are essentially semiconductors as a result of having small gaps and low excess hole concentrations.

The variation of physical properties of carbons with heat-treatment depends upon the phase of the starting material at temperatures below $\sim 450^\circ\text{C}$. Electron micrographs of fine coke particles show that all soft cokes (fluid phase below 450°C) break during milling into anisotropic lamellae in which the microcrystals are oriented with basal planes parallel to the lamellar plane. While soft cokes are raw ($H \leq 600^\circ\text{C}$), this structure can be destroyed by milling. Hard cokes (from solid organics) break into roughly equiaxed particles indicative of amorphous material. During graphitization soft coke particles tend to develop characteristic crystalline outlines whereas hard cokes are unchanged.

Replicas of partially imbedded graphitized particles of Thermax carbon black (gas phase carbonization) suggest that the particles crystallize to form a definite type of polyhedron. Particles graphitized while imbedded in a coke matrix retain their individuality. This and other evidence indicate that the polyhedral facets correspond to graphitic basal planes and that the particles are closed with respect to crystal growth. The polyhedron probably results from fulfillment of a requirement for minimum interfacial energy compatible with the imposed restrictions upon crystalline growth. 110 pages. \$1.38. MicA54-1823

PHYSICS, NUCLEAR

THE EXPERIMENTAL DETERMINATION
OF THE DIFFERENTIAL CROSS SECTIONS
FOR THE $C^{12}(d,p)C^{13}$ REACTION FOR 3.29 MEV.
INCIDENT DEUTERONS AND THE $C^{13}(d,t)C^{12}$
REACTION FOR 2.19 MEV. AND 3.29 MEV.
INCIDENT DEUTERONS AS A FUNCTION OF THE
ANGLE OF THE EMITTED PARTICLES

(Publication No. 8456)

Harry Dahl Holmgren, Ph.D.
University of Minnesota, 1954

The differential cross sections for the $C^{12}(d,p)C^{13}$ reaction have been measured for 3.29 Mev. incident deuterons at fifteen center-of-mass angles extending from 5.8° to 140° . The differential cross sections for the $C^{13}(d,t)C^{12}$ reaction have been measured at laboratory energies of 2.19 Mev. and 3.29 Mev. for sixteen center-of-mass angles extending from 5.2° to 144° . The reaction protons and tritons were separated from the scattered deuterons and the other reaction products by a combination of magnetic analysis and range measurements in nuclear emulsions. The experimentally observed differential cross sections for these reactions have been compared with the theoretical angular distributions calculated on the basis of Butler's formula for stripping and pick-up reactions.

111 pages. \$1.39. MicA54-1824

DESIGN AND CONSTRUCTION OF A THIN LENS
COINCIDENCE SPECTROMETER WITH
APPLICATIONS TO THE DECAY OF Eu^{152} AND Eu^{154}

(Publication No. 8412)

Richard Erick Slattery, Ph.D.
University of Michigan, 1954

A coincidence arrangement between two thin lens beta spectrometers has been designed and constructed. The spectrometers are mounted at 180° with respect to each other on a common tube. The

individual halves of the instrument are of conventional design, utilize ring focusing, and are capable of resolutions of about two percent. Coupling between coils when both are carrying current is less than one percent, and is easily compensated. The coincidence spectrometer is mounted north-south to reduce effects due to the horizontal component of the earth's field. The vertical component is cancelled by means of large Helmholtz type coils. Geiger tube detectors were used, and coincidences were measured by means of both Rossi and Garwin circuits on different occasions, with resolving times of 0.38 and 0.28 microseconds respectively.

A characteristic of this instrument is the narrowing of conversion lines (i.e., improved resolution) when coincidence spectra are plotted. The cause of this narrowing is discussed, with examples drawn from the decay of Hf^{181} .

Using the component thin lens spectrometers, normal beta spectra and conversion coefficients can be measured. By means of the coincidence arrangement, coincidences between conversion lines and between conversion lines and beta spectra can also be determined. It is demonstrated how the conversion coefficients of obscured peaks can be established. The advantages and disadvantages of the coincidence spectrometer are discussed.

The radioactivity of $Eu^{152,154}$ was examined by means of this instrument. The beta spectrum was complex, consisting of components with end-points at 1.45 ± 0.05 Mev, 0.70 ± 0.03 Mev, and 0.33 ± 0.10 Mev. The last mentioned end-point is doubtful due to the presence of conversion lines with accompanying scattering. Coincidences were noted between the conversion lines due to the 122 or 123 (unresolved) and 244 kev transitions. No coincidences were noted between the 122 and 123 kev conversion lines, the 344 and 244 kev conversion lines, or between the 122 or 123 and 344 kev conversion lines. Coincidences were noted between the 344 kev transition and the beta spectrum with 0.70 Mev end-point. The coincidence beta spectrum was plotted. No other coincidences between conversion lines and beta spectra were found.

This information, combined with other data from a crystal summing spectrometer allowed the decay schemes of Eu^{152} and Eu^{154} to be established.

104 pages. \$1.30. MicA54-1825

PHYSIOLOGY

EFFECT OF pH CHANGES ON VAGAL INHIBITION OF THE HEART

(Publication No. 8497)

Gilbert S. Campbell, Ph. D.
University of Minnesota, 1954

The occurrence of respiratory acidosis during surgical procedures is well documented. A possible causal relationship between this acid base disturbance and the occasional appearance of cardiac arrhythmia and/or cardiac arrest in such patients has been suggested. This investigation embodies an experimental analysis in dogs of the cardiac response to vagal stimulation at different blood pH levels.

Mongrel nembutal anesthetized dogs were subjected to faradic and chemical vagal stimulation. Blood pH levels were altered by inhalation of gas mixtures containing carbon dioxide, by mechanical hyperventilation, by the intravenous administration of hydrochloric acid, lactic acid, and sodium bicarbonate. Measurements obtained during these experiments include arterial blood pH, bicarbonate, and carbonic acid concentrations, electrocardiograph, pneumograph, arterial blood pressure, and analyses on the inhaled gas mixtures.

Sixteen dogs were subjected to hypercapnia, hypercapnia and hypoxia, or hypoxia alone. Hypercapnia alone or hypercapnia plus hypoxia increased the effect of vagal stimulation on the heart. In the presence of elevated carbon dioxide concentration the same degree of vagal stimulation produced a longer cardiac asystole and a more pronounced bradycardia than did vagal stimulation in the same animals breathing room air. Hypoxia did not augment the effect of vagal stimulation. These responses were repeated many times and were reversible. The reversible effects of 10 per cent carbon dioxide were still present in dogs which were given eserine salicylate.

Studies in which blood pH was depressed by administration of carbon dioxide, hydrochloric acid and lactic acid, and others in which it was elevated by means of mechanical hyperventilation or sodium bicarbonate, were also done. Under conditions of an acid blood pH the cardiac effects of faradic cervical vagal stimulation and intravenous acetylcholine were augmented to a significant degree. On the other hand, the response of the heart to parasympathetic stimulation was decreased in the presence of a hyperalkaline blood pH. The hydrogen ion concentration seemed to be the controlling factor, not the carbon dioxide concentration per se.

The optimum pH range for cholinesterase activity is pH 7.5 to 8.5. Consequently, in the presence of a hyperalkaline blood pH the effects of parasympathetic stimulation of the heart should be decreased; whereas an acid blood pH should be associated with

an augmentation of parasympathetic stimulation. Such results were obtained in this study.

It seems important to avoid or correct acidosis in surgical patients in order to avoid augmentation of vagal inhibition of the heart. Perhaps such careful attention toward these acid-base disturbances will result in a lowered incidence of cardiac arrhythmias and/or cardiac arrest.

79 pages. \$1.00. MicA54-1826

A STUDY OF THE EFFECT OF PHENYLHYDRAZINE ON AEROBIC AND ANAEROBIC METABOLISM OF AVIAN ERYTHROCYTES

(Publication No. 8787)

William Frederick Geber, Jr., Ph. D.
Indiana University, 1954

Previous studies by Warburg indicated that phenylhydrazine reacted with the oxyhemoglobin of erythrocytes to form a pigment that was apparently not methemoglobin since it was not metabolically reduced to hemoglobin, and also that erythrocytes so treated exhibited a greatly increased aerobic metabolism as manifested by increased oxygen consumption. The problem presented here then, is whether phenylhydrazine can form methemoglobin and if formed, will the cells be capable of reducing it.

High levels of methemoglobin were produced in avian erythrocytes by treating blood, drawn by cardiac puncture, with buffered phenylhydrazine hydrochloride. The erythrocytes were washed with chilled saline several times before and after treatment and final resuspension was made in Krebs Ringer solution. Anaerobic reduction of methemoglobin was followed manometrically in Warburg apparatus by recording CO uptake. Aerobic reduction was measured by Van Slyke analysis.

Aerobic glycolysis was found to be well below anaerobic glycolysis in both experimental and control cells. This finding was properly attributed to a Pasteur effect on the aerobic glycolysis. Under anaerobic conditions, each successive increase in phenylhydrazine brought about a corresponding decrease in glycolysis. Under aerobic conditions, each increase in phenylhydrazine caused a corresponding increase in glycolysis. Under both conditions, the experimental glycolysis was significantly above the control level for the first hour which was the period of greatest apparent reduction of methemoglobin. Aerobically, experimental glycolysis remained above control glycolysis throughout the three hours whereas under anaerobic conditions the second and third hours manifest an apparent decrease in glycolysis. However, this latter phenomenon was attributable to a greater shift of the experimental cell intermediary

metabolism to some secondary pathway such as the hexose monophosphate shunt.

Pyruvate formation under anaerobic conditions was limited to the first hour of the three hour experimental period as was the reduction of methemoglobin. Under aerobic conditions, pyruvate formation continued throughout the three hours, although the methemoglobin reduction was apparently limited to the first hour. This continued formation of pyruvate strongly suggests that there is continued formation and reduction of methemoglobin, throughout the experimental period, in a type of turnover reaction.

When low concentrations of phenylhydrazine, i.e. 0.2 mg./ml. blood, were used in the initial treatment to form methemoglobin, all the methemoglobin was reduced. Successively higher concentrations of

phenylhydrazine above this level resulted in a failure to regain all of the oxygen capacity initially lost. In a comparative study between the methemoglobin formed by phenylhydrazine and that formed by sodium nitrite, it was found that the methemoglobin which was present was metabolically reduced at a velocity twice that found for the nitrite induced methemoglobin.

Spectrophotometric analysis of the pigments obtained from laking erythrocytes treated with phenylhydrazine showed that in addition to the methemoglobin present in the treated erythrocytes, there is an additional pigment. This additional chromogen is postulated to represent part or all of the pigment that could not be metabolically reduced by the erythrocytes.

84 pages. \$1.05. MicA54-1827

POLITICAL SCIENCE

POLITICAL SCIENCE, GENERAL

EQUALITY OF OPPORTUNITY FOR LATIN-AMERICANS IN TEXAS: A STUDY OF THE ECONOMIC, SOCIAL, AND EDUCATIONAL DISCRIMINATION AGAINST LATIN-AMERICANS IN TEXAS, AND OF THE EFFORTS OF THE STATE GOVERNMENT ON THEIR BEHALF

(Publication No. 8633)

Everett Ross Clinchy, Jr., Ph. D.
Columbia University, 1954

This is a discussion of the social, economic, and educational discrimination against Latin-Americans in the state of Texas, and of the efforts of the government of that state to lessen such discrimination. These efforts are contrasted with those made by other states to protect the rights and opportunities of minority groups within their borders.

Mexican-Americans, or Latin-Americans as they are here termed, have lived in what is now Texas since the early days of Spanish settlements during the seventeenth century. Their numbers were insignificant until after 1900. By 1940, there were about 1,500,000 living within the state. Added to this group is an indeterminate number of "wetbacks", or immigrants who are not permanent residents but who cross the border illegally to do agricultural work in Texas.

Open conflicts between Latin-Americans and the Anglo-Saxons who settled in Texas during the nineteenth century made for strained relationships early in the history of the state. As time went on, the "Anglo" group became dominant; by far the great majority of the Latin-Americans never gained a firm foothold on the socio-economic ladder of Texas life. By the 1920's, the Latin group was clearly relegated to a position comparable almost to that of the Negro population of the state.

Discrimination against the Latin-American has

been most evident in three ways. First, they have not enjoyed equality of status in such public places as theatres, hotels, restaurants, or barber shops. Secondly, they have for the most part been forced to accept the lowest paid jobs in the Texas economy; few are in key business positions or in the professional class. Thirdly, by far the great majority of Latin-American children drop out of school after the fourth grade, and until 1948 those who did attend were generally segregated from "Anglo" students.

No official state action was taken to combat these conditions until the early years of World War II brought a shortage of agricultural labor to the Southwest. Negotiations were opened between Mexico and the United States to provide for the contracting of Mexican labor to be sent to farms in the United States. Mexico refused to send this contract labor to Texas because of discrimination against Latin-Americans in that state. The reaction of the state government was to establish the Good Neighbor Commission, an official state agency which was to deal with the matter of discrimination. At the same time, educational authorities of the state began a program of education among school leaders in Texas in an attempt to solve some of the educational problems. The problem of segregation in the schools was considerably lessened in 1948 when a decision handed down by a Federal District Court made such segregation illegal.

The work of the Good Neighbor Commission has undoubtedly improved the situation somewhat, and the school systems have made a valuable contribution. But the economic problem has by no means been solved, and "wetbacks" continue to pour into the state to force down wage levels. This problem demands immediate attention. The Good Neighbor Commission itself could be strengthened to act as a vital center for information and recommendations to the legislature. The ultimate solution of other states, namely FEPC legislation, seems impractical at present.

240 pages. \$3.00. MicA54-1828

A POLITICAL BIOGRAPHY OF INUKAI TSUYOSHI

(Publication No. 8421)

Joseph Lee Sutton, Ph. D.
University of Michigan, 1954

The purpose of this work is to examine the political development of democratic parties in Japan from their beginning up to 1932 when they began to decline. For this purpose the life of Inukai Tsuyoshi is studied here to give a manageable framework. The precise problems to be studied are the origins of the parties, the background of the politicians, the methods of operation of the politicians and the parties, and the problems which led to the eventual downfall of the party system in Japan.

The first part of the thesis, Chapters I to V, take up the background of Inukai Tsuyoshi including the locality in which he was born, his educational experience, and finally his introduction into politics. An effort is made to analyze the factors which made Inukai a likely person to enter politics. For this purpose his family background and social position are examined. In addition the contacts which he made during his educational career and the significance of these contacts are also investigated. Throughout these first chapters an effort is made to generalize from Inukai's experience by surveying the backgrounds and experience of his closest associates.

Chapter V is devoted to a study of the workings of Japanese party politics on the local level. In this chapter the forces and institutions important to the Japanese politician are catalogued and their significance evaluated. The fact that these institutions are based on personal loyalty to the politician rather than to his party is noted so as to relate this fact to the lack of cohesiveness in the Japanese party.

The third part of this work (Chapters VI and VII) is concerned with Inukai's role in the pre-war party movement, and the alternatives which he opposed to the program of the militarists. In describing his role in Japanese party politics it is pointed out that the main effort of liberal party politicians was directed toward the establishment of a responsible party system rather than being concerned with the development of any particular party. To do this they were forced to wage unceasing war on the bureaucrats and militarists. The fact that the parties did have an alternative to the solution of Japan's woes as expounded by the militarists is demonstrated when Inukai's speeches and writings are assembled and analyzed. The final portions of the work (Chapters VIII and IX) concern Inukai's rise to the Prime Ministry and the anti-climatic consequences which led to his assassination.

Two general conclusions emerge from the data assembled on Inukai. First, much of the political success of the Japanese parties was the result of their ability to adapt pre-existing institutions to modern political use. In effect many of the institutions loosely referred to as "feudal" in Japan and commonly believed to have led to the direct decline of the Japanese parties sustained them against great

odds. The second conclusion is that the parties did have a program to oppose that of the military and were followed for a while by a considerable part of the Japanese public, but the combination of external and internal circumstances in the 1930's brought about their fall and their replacement by the militarists. 291 pages. \$3.64. MicA54-1829

PUBLIC WELFARE ADMINISTRATION IN
MICHIGAN AT THE CITY-COUNTY LEVEL
WITH SPECIAL REFERENCE TO
INGHAM AND SAGINAW COUNTIES

(Publication No. 8430)

Alice Wellington Wallace, Ph. D.
University of Michigan, 1954

The purpose of this study was to analyze the administration of public welfare at the local level of government in Michigan, with particular reference to its adjustment to changing social and economic conditions over the last two decades. Emergency measures taken during the thirties imposed new patterns of welfare administration upon local government. The Social Security Act required reorganization on all levels of government for participation in its grants-in-aid programs. Since the establishment of the Social Security System, several study commissions have recommended further changes in local organization and procedures. Except for the changes necessitated by the Social Security Act, reorganization of public welfare administration at the city-county level has been generally superficial. The problem which this study undertakes to solve is the "lag" in reorganization of local welfare structure and services, despite continued efforts at reform by academic and professional groups.

The study commissions mentioned above reported certain inadequacies, inequities, and duplications in services to welfare clients. The study was begun with the assumption that the defects noted by the study commissions do exist. Two hypotheses have served to guide the study: (1) A substantial portion of the inadequacies, inequities, and duplications could be removed by action at the local level of government. (2) The strong resistance to change exerted by the local policymakers has been due to: lack of interest in public welfare; lack of knowledge about public welfare; and a hard core of conservatism, conceived in the Puritan philosophy of poverty and fostered by pride in "grass-roots" autonomy.

The assumption that the present system has serious limitations as reported by the study commissions was tested initially by an examination of welfare budgets, case loads, hospitalization statistics, and incidence of repeaters on relief rolls. Next, field surveys in two Michigan counties were undertaken to determine how adequately and how equitably the present system is serving the clients. The field surveys were designed also to evaluate the recommendations of the study commissions. Local welfare practitioners and interested officials were

interviewed in regard to the present system and the proposed changes.

The legal authority, financial support, and administrative structures of current welfare programs were examined to determine whether the first hypothesis was valid.

Ingham and Saginaw Counties were selected for field surveys because they are economically and geographically similar; yet Ingham County has been relatively willing to consolidate its welfare agencies, while Saginaw County has continued a comparatively decentralized organization. After tracing the history of public welfare in Michigan from the Territorial Period to the present date, the development of welfare administration in the two counties was carefully examined, to determine why their structures differ. As a final step, local legislators were interviewed very comprehensively, in regard to public welfare policy and philosophy.

Three general conclusions have been drawn from the study: (1) Decentralization of welfare agencies and duplication of services result in serious inequities to welfare clients; (2) Substantial integration of agencies, professionalization of staffs, and greater uniformity of treatment for all population groups could be accomplished by local units of government; and (3) The continuing resistance to reorganization by local legislators stems largely from ignorance of the principles and procedures involved, and from fear that reorganization would imperil mores and beliefs to which they are devoted.

327 pages. \$4.09. MicA54-1830

AUSTRALIA'S RELATIONS WITH THE UNITED STATES: 1941-1949

(Publication No. 8432)

Austin Frederic Walter, Ph. D.
University of Michigan, 1954

The purpose of this study is to examine, compare and evaluate the more important military, political and economic relations between the governments of Australia and the United States from 1941 through 1949. This study is concerned with a period during which the Labor Party remained in continuous control of the Australian Government and during which the conduct of the foreign policy of that country was the responsibility of Dr. Herbert V. Evatt, the Minister for External Affairs. Much of the study centers on the methods and policies employed by Dr. Evatt in conducting Australia's relations with the United States. The importance of this study derives from the increased relationships between Australia and the United States that occurred as a result of their a) extensive wartime military and economic collaboration, b) new-found interest in the Pacific area, c) initiative and leadership in the formation and functioning of the United Nations, and d) intense concern with the ways and means of insuring economic stability in the postwar era. The study evaluates Australian-American relations in terms of a small-big power relationship. Attention is also centered

on the contrasting economic philosophies and programs of the two countries.

The first chapter briefly examines the prewar relations of Australia and the United States and indicates the beginning of an Australian foreign policy largely independent of Great Britain and oriented towards the United States as a result of the outbreak of the war in the Pacific. The second chapter inquires into the nature and extent of the wartime cooperation between these two allies in the military and economic spheres. The third, fourth, fifth and sixth chapters are concerned with matters related to the achievement of a peace settlement in the Pacific. In these chapters consideration is given to 1) Australia's efforts to acquire a prominent place in the affairs of the Pacific, 2) the Australian and American positions on the status of Pacific island bases and island territories formerly occupied by Japan, 3) the machinery and policies devised for the occupation of Japan, and 4) the character of the eventual peace settlement with Japan. The seventh and eighth chapters portray the roles Australia and the United States assumed in the framing of the United Nations Charter and in United Nations affairs from 1946 through 1949. The ninth chapter describes the economic relationships between Australia and the United States and analyzes their contributions to the international economic conferences that occurred during and after the war. The concluding chapter suggests the reasons for the aggressive qualities that characterized Australia's relations with the United States and indicates that in both Pacific and United Nations affairs Australia offered an alternative and posed a challenge to the leadership of the United States.

Despite the many irritations and differences that arose between them in the 1941-1949 interval as a result of ideological differences, big-small power concepts and personality factors, Australia and the United States demonstrated by faith and practice that they were wedded to the democratic way of life. The give and take that characterized the relations of the two countries during this period contributed to their individual growth and understanding and represented an international application of their internal democratic experiences.

411 pages. \$5.14. MicA54-1831

POLITICAL SCIENCE: INTERNATIONAL LAW AND RELATIONS

OUTER MONGOLIAN NATIONALISM, 1900-1919

(Publication No. 8363)

Robert Arthur Rupen, Ph. D.
University of Washington, 1954

The dissertation attempts to prove:

1) The nationalism of Outer Mongolia was a "defensive nationalism": defensive in reaction to Chinese

political, economic, military, and cultural incursions on the Mongols.

2) In 1919, when Autonomy ended, nationalist feeling had still not attained anything like universal recognition of acceptance among the Mongols; yet the increase in this feeling since 1900 is clearly evident: an increase both quantitative and qualitative – a greater number of people were “nationalists” and their nationalist feelings were more intense. The experience of Autonomy increased the appetite for it.

3) This national consciousness, defensive in origin, began to take on a more positive character in the period of Autonomy: a definite trend toward centralization and unification set in.

4) Among the most active and important of the Mongolian nationalists were “foreigners” – Inner Mongols, Buriats, and Barguts.

5) Russia to a considerable degree fostered and encouraged this national movement; yet at the same time she undermined it in negotiations and relations with China and Japan.

6) Few elements of social revolution accompanied this increase in national consciousness: church and traditional ruling-classes remained in practically unchallenged control. Efforts to modernize and Westernize were extremely limited in scope and effect.

Other generalizations of some importance can be drawn:

Common language, common religion, common tradition, and common way-of-life lay at the foundation of a Mongol state. The limited historical and geographical differentiation of Outer Mongolia from the rest of Mongolia was strengthened by Russian action to limit the boundaries of Autonomous Mongolia. Chinese influence in Outer Mongolia, though limited by the traditional restrictive Manchu policies, nonetheless in every field and in every way greatly exceeded Russian influence there. Economically, the Chinese position was especially powerful: many tens of thousands of Chinese traders, merchants and moneylenders operated throughout the land, with their threads of silver binding the Mongols ever more closely to them.

Many Mongolian leaders showed strong patriotism and national feeling, but they were not united in agreement on the best way to maintain and develop their independence. Some striking and impressive personalities emerged despite the general handicap of lack of familiarity with the modern world. Honest and intelligent Mongols worked with devotion and sincerity for the welfare of their fellow-citizens, and many of them literally gave their lives for their country.

Universal recognition or acceptance of nationalist feeling among the Mongols would require extensive education, much greater inter-communication among the inhabitants, probably a higher standard-of-living, greater participation of “common people” in the government and its agencies, perhaps the common experience of serving in a national army, and a longer period of time than the brief years of Autonomy provided.

Pan-Mongolism was employed for widely varying political purposes:

- 1) Inner Mongols and Barguts stressed Pan-Mongolism as an anti-Chinese weapon.
- 2) Buriats stressed it as an anti-Russian weapon.
- 3) Japan, through Buriats and Inner Mongols, used it against both China and Russia.
- 4) Ungern von Sternberg tried to fashion it into an anti-Bolshevik weapon.

“Mongolia for the Mongols” had become a slogan for which men died, and Outer Mongolia struggled desperately to maintain its Autonomy – the truth of these statements is a proof of the reality of an increased Mongolian nationalism. A new factor had arisen in the relations of Russia, China, Japan, and Mongolia.

399 pages. \$4.99. MicA54-1832

POLITICAL SCIENCE: PUBLIC ADMINISTRATION

RECENT DEVELOPMENTS IN THE ADMINISTRATION OF THE STATE INCOME TAX

(Publication No. 8478)

Clara Penniman, Ph.D.
University of Minnesota, 1954

This study on recent developments in income tax administration in the states has attempted to review important aspects of administration of state income taxes in 1952. At a time when every unit of government anxiously searches for increased revenues, improved administration of existing taxes may be one of the easiest and most equitable means to this goal. Every state income tax administrator knows that some revenue escapes. The best administrators continuously attempt to reduce the gap between the total taxes owing and the total taxes reported and paid. Other administrators work within a situation in which the state receives little revenue above that level which the most conscientious taxpayers voluntarily report and pay.

Efficiency and effectiveness in administration are intertwined, but efficiency presumably measures cost or utilization of resources in the obtaining of any particular level of effectiveness. Effectiveness of state income tax administration then measures the degree to which the department secures tax returns from all taxpayers obligated to report under the law, secures full reporting of legal income and accurate reporting of legal deductions and exemptions, and secures full payment of the tax due. Effectiveness can be measured in quantitative and qualitative terms. In analyzing income tax administration in the states, we have stressed qualities of effectiveness. The absence of necessary quantitative information has made it impractical to measure either effectiveness by quantitative means or to attempt a real appraisal of efficiency among the states.

The income tax states have met a part of the challenge to administration in the expanding economy of the 1940's and 1950's. Administrative structures as a whole provide more opportunities for staff service

specializations and for information exchange among tax administrative units. Personnel are believed to be better qualified today than at the beginning of the period. New techniques - short form returns, standard deductions, tax withholding at the source, key punch mechanization of particular processes - for attaining certain values of effectiveness have been investigated by many states and installed in several. Federal-state cooperation has reached a new height through the cooperative audit program in five states. Several states have developed a specialized, and presumably more effective, system for uncovering the deliberate income tax evader.

On the negative side are the several states which have made few improvements in administration over the years and reflect major deficiencies today. Arizona, Arkansas, Iowa, Louisiana, New Mexico, North Dakota, and South Carolina appear to belong in this class. Several other states are on the borderline if not actually there. None of these states has an adequately qualified staff nor a staff sufficiently large to meet even medium demands of effectiveness. None of these states had an operating merit system in 1952 for selection of personnel. None of these states regularly and fully matched information returns with income tax returns. None made full, effective use of the available resources of the Bureau of Internal Revenue. Field services and investigations were limited. Out-of-state field auditing seldom occurred. None of these states, except Arizona, had attempted to utilize key punch machinery in the administrative process. None of these states had attempted withholding for improved collections. (Perhaps it is well that they had not, as present inequities in enforcement might merely have been compounded.) None of these states had developed research which would provide information necessary for even minimum quantitative testing of present effectiveness. Prosecutions for failures to file or to report income had almost never occurred even in the most aggravated cases of non-compliance.

A number of specific recommendations are made in the study to improve evaluation of state effectiveness and efficiency and to strengthen effectiveness of state income tax administration.

415 pages. \$5.19. MicA54-1833

**PARTICIPATION OF CITIZENS IN ADVISORY
COMMITTEES AND ADMINISTRATIVE BOARDS:
SELECTED MICHIGAN CITIES, 1945-1952**

(Publication No. 8400)

Robert Benjamin Richert, Ph. D.
University of Michigan, 1954

Local government offers many opportunities for citizens to participate in the governmental process, and citizen committees are widely used by cities for this purpose. This is a study of 348 citizen committees reported by forty-five Michigan cities in answer to a questionnaire survey.

The committees were first examined for patterns of structural and purposive similarity. Three distinct

categories were distinguished and they were called administrative, screening and advisory. Administrative committees have legal responsibility and adequate authority to administer standard municipal services. They were concerned with activities such as city planning, civil service, libraries, public works or employee retirement systems. Screening committees have a limited but well defined role in the administrative process in a review or appellate capacity, but lack power of independent action. Most of them were concerned with regulatory codes such as zoning or building construction. Advisory committees lacked the power of independent action and generally were limited to studying or publicizing a wide range of peripheral and non-recurrent community problems.

Administrative and screening committees have structural characteristics different from advisory committees. They are permanent and have sound legal bases. They tend to be small committees, and members serve for relatively long terms. Members usually take an oath of office. The committees usually are financed by the city and have paid staff assistants. Advisory committees tended to be temporary and founded on vague legal bases. They were large committees and the terms of members were short or indefinite. Members seldom had to take an oath of office. The committees usually did not receive financial or staff assistance from the city.

The flexibility and impermanence of advisory, and to a lesser degree screening, committees recommend them to officials interested in securing the identification of lay citizens in support of administration goals.

The study also sought to explain variations in the use of citizen committees from city to city. The fourteen council-manager cities over 17,000 population were used as a pilot group to check for correlations between the number of committees in a city and selected factors in the environmental complex and governmental structure. Size of the city was the only factor which showed a direct bearing on the number of committees: the larger the city, the more committees. There was some relationship between the number of committees and the age of the city charter. This was inconclusive because the larger cities tended to be those with the older charters. There was no discernible relationship between the number of committees and factors such as racial composition of the community, metropolitan location, rate of growth, or differences in governmental practices.

The cities of Grand Rapids and Flint were selected for closer analysis in an attempt to relate differences in kinds of citizen committees to community differences. The cities were about the same size and both had the council-manager form of government. On important standards for measuring civic welfare, governmental operation, and vitality of citizen interest in community affairs, the cities differed sharply. Grand Rapids as the more stable community made greater use of administrative committees, and its screening and advisory committees had a more impressive record of tangible

accomplishments than did those for Flint. Divisive forces in Flint were in part reflected in the widespread and ineffectual use of advisory and screening committees.

Three conclusions might be drawn about citizen committees as a means for securing citizen participation in the governmental process. 1) If responsibility for overall administration is to be vested in responsible officials, advisory and screening committees are of greater usefulness to officials than

administrative boards. 2) The types of activities best performed by citizen committees – study, public relations, expressing and clarifying community opinions – are not subject to measurement by the same pragmatic criteria used for evaluating the work of officials. 3) The value of citizen committees is largely symbolic as an affirmation of basic tenets and aspirations of democracy which make the process of citizen participation as important as its products. 391 pages. \$4.89. MicA54-1834

PSYCHOLOGY

PSYCHOLOGY, GENERAL

A SPECIAL ANALOGIES TEST FOR THE EVALUATION OF GRADUATE ENGINEERS

(Publication No. 8452)

Marvin Dale Dunnette, Ph.D.
University of Minnesota, 1954

Major Advisor: Donald G. Paterson

The major objective of this project has been to develop an evaluation instrument for graduate engineers. Basic to this development was the widely recognized need for a test which would be sensitive to proficiency differences within this high ability group. Analysis of the literature on the subject of engineering evaluation led to the hypothesis that effectiveness in engineering studies and on engineering jobs is, to a large extent, a function of general ability, previous engineering achievement, and facility with mathematics. An analysis of the literature with regard to the verbal analogy item suggested that special analogies might be written to serve a composite function in measuring knowledge in all the above areas.

Minnesota Engineering Analogies Test (MEAT) has resulted, therefore, from an effort to combine features of an abstract reasoning test with those of a comprehensive engineering achievement test.

Development of MEAT progressed through two phases: exploratory and preliminary. The first phase was planned to determine the feasibility of using the analogy item for evaluation of engineering personnel. This study was restricted to a sample of 203 seniors and 53 graduate students in the Institute of Technology at the University of Minnesota. Results were essentially positive, and important information was gained to aid in preparation of additional items.

Preliminary forms (C and D) of MEAT contained 74 and 73 items respectively. Tests were administered to over 1,000 students and employed engineers located throughout the country. In order to identify the most discriminating items, three distinct criteria were adopted. These included: Total Test Score; Differential Placement (i.e. the extent to which items

discriminated between pure research and sales engineers); and Scholastic Standing. Item analyses resulted in retention of fifty items in each form.

These final forms, designated E and F, were studied with respect to: (1) the performance of different engineering groups (e.g., different educational levels and different engineering duties); (2) test reliability; (3) the relationship between test performance and academic achievement; and (4) the relationship between test performance and ratings of engineering effectiveness in schools and on-the-job.

It appears that Minnesota Engineering Analogies Test may be used appropriately as a general evaluation instrument for graduate engineers. This conclusion is based on several lines of evidence:

1. As shown in Table 1, scores on MEAT are slightly to moderately related to engineering effectiveness whether it be defined as academic success or as on-the-job-proficiency.

Table 1

Median Correlations Obtained Between Measures of Engineering Effectiveness and Scores on Forms E and F of MEAT.

Criterion	Number of Coefficients Computed	Range Of Values	Median Values
Undergraduate Grade Point Averages	7	0.38-0.62	0.48
Graduate Grade Point Averages	4	-0.02-0.64	0.33
Ratings of Graduate Student Effectiveness	7	0.26-0.70	0.50
Ratings of On-the-job Effectiveness	9	0.11-0.37	0.30

In all likelihood, MEAT will prove useful in prediction of future achievement in graduate studies and on engineering jobs.

2. Scores on MEAT show a consistent hierarchy ranging from highest scores for research engineers to lowest scores for sales and technical service engineers. This suggests that MEAT may prove especially useful for differential placement of applicants for engineering positions in business and industry. It is likely that such use of MEAT will lead to large dollar savings stemming from reduction in trial and error methods for placing young engineers.

3. Increasing engineering training is accompanied by increasing mean scores on MEAT. It is probable that repeated testing with the two forms of MEAT may provide a measure of an engineer's "growth" as he progresses through graduate school or as he learns while on-the-job. MEAT may prove useful in fostering more appropriate instruction in engineering courses. Thus, MEAT provides a basis for sectioning of engineering classes, a practice which can lead to general improvement in quality of instruction.

Perhaps the major conclusion from this research is that the verbal analogy test item has again proved its versatility and its right to be extended to other fields.

226 pages. \$2.83. MicA54-1835

A STUDY OF THE RELATIONSHIP BETWEEN RESPONSIVENESS TO COLOR ON THE RORSCHACH EXAMINATION AND IMPULSIVE BEHAVIOR

(Publication No. 8525)

Paul Fredrick Mandeville, Ph. D.
University of Nebraska, 1954

Adviser: Don W. Dysinger

In this study two experimental variables were employed, the type subject (Impulsive or Inhibited), and different stimulus conditions. Subjects (N=31) were chosen according to the criterion of pooled ratings by associates and were tested individually after random assignment to one of two different type test situations. In one situation, the subjects were shown the standard Rorschach cards II, III, VIII, IX, and X in this order. In the other situation, subjects were shown achromatic versions of these same cards in the same order. In both test situations, outline forms of the cards used were shown to subjects prior to the use of either the standard or achromatic version. The test instructions were similar to those customarily used in the clinical setting except that since the standard or achromatic version of the card always followed its outline version, the additional instruction, "Does this bring anything new, different, or additional to mind?" was also employed. All hypotheses relate to additional responses given to the standard or achromatic card following presentation of the respective outline form.

As far as the selection of subjects was concerned, rated behavior on the basis of a specified definition was the sole external criterion of Impulsiveness employed. Ratings were made on a seven point scale extending from very Impulsive to very Inhibited. As

in many other studies of reaction to color, the achromatic cards were used to control for color effects. The outline cards, always used immediately before presentation of the corresponding chromatic or achromatic version of the card, were for the purpose of familiarizing subjects with the general form configuration of the blots. By virtue of the contrast afforded, they also served to enhance the stimulus impact of the succeeding colored or shaded card. The number of responses given to outline cards was also employed as an index of "general responsiveness", an index free, as it were, from the possibly disturbing effects of color and/or shading.

The following general statements of hypotheses made in the study indicate how Impulsive subjects were expected to differ from Inhibited with regard to the five characteristics of responsiveness initially selected as a basis of comparison: 1) Impulsive subjects give a greater number of responses to chromatic or achromatic cards; 2) Impulsive subjects give a greater number of C plus CF responses to chromatic cards; 3) Impulsive subjects have a faster average time of first response to chromatic or achromatic cards; 4) Impulsive subjects give fewer qualifications to chromatic or achromatic cards; 5) Impulsive subjects give a greater number of "personalized" responses to chromatic or achromatic cards.

Results indicate that Impulsive subjects give a greater number of responses, show greater general productivity, whether they are viewing outline, chromatic, or achromatic cards, than do Inhibited subjects. Evidence supporting hypotheses 1, 2, 4, and 5 (as listed above) followed from the results of the study.

Average rating on Impulsiveness is shown to be positively and significantly correlated with number of C plus CF responses to chromatic cards, total number of responses given to all but the chromatic series of cards, and number of human movement responses given to all ten cards presented a subject. A negative, though non-significant, correlation results between average rating and number of heavy shading responses.

In addition to the evidence for and against the specific hypotheses of this study, results support the conclusion that the personality variable Impulsiveness is a more important factor in determining the number of responses to Rorschach stimuli than is the presence or absence of color and shading in a card.

80 pages. \$1.00. MicA54-1836

A COMPARISON OF THE PERSONAL, EMOTIONAL, AND FAMILY ADJUSTMENT OF CRIPPLED AND NORMAL CHILDREN

(Publication No. 8465)

Anna Agnes Martorana, Ph. D.
University of Minnesota, 1954

The purposes of the study were (Part A) to investigate the personal, emotional, and family

adjustment of crippled children and the adjustment of their families to them, and (Part B) to study the influence of the variables of sex, mental age, age of onset, and the degree of handicap on the crippled child's adjustment.

Sixty-four children, 32 crippled and 32 normal, matched as to CA, IQ, and SE were studied by objective and projective methods. The tests used were: Rogers - A Test of Personality Adjustment, Nobles County Every-Child Survey materials, Draw-a-Man, Self-portrait, Three Wishes Technique, and Situational Pictures. Attitudes of the mothers of the children were studied through the use of the Minnesota Scale of Parents' Opinions, Fels-devotion-rejection-Scale, Teachers' Rating Scale, and a recorded Questionnaire-Interview. The "t" test was used to determine the significance of differences, and an analysis of variance was made to determine the effectiveness of the variables studied. Projective techniques were qualitatively analyzed.

The findings of Part A were:

1. Crippled children made consistently poorer scores than did normal children on tests of adjustment.
2. Approximately as many crippled as normal children draw a man as normal.
3. Seventy-two per cent of the crippled children drew self-portraits which revealed their bodily defects. The other crippled children showed a partial recognition of their crippling condition.
4. Half of all the wishes of crippled children were related to their condition. Normal children wished for material things.
5. Responses of crippled children to Situational Pictures showed a greater sensitivity to crippling conditions than did the responses of normal children. The responses of crippled children tended to show rejection of or resentment toward the condition.
6. Scores made by mothers of crippled children on the Minnesota Scale of Parents' Opinions were not significantly different from those made by mothers of normal children. However, the mothers of crippled children received lower scores on the scales rating parent-child relationships, and gave fewer positive answers to the items of the Questionnaire-Interview, thus revealing more concern about their children. Their first wish was that the crippled child walk normally.

The results of Part B were:

1. The variables of sex and mental age of the crippled child, the age of onset of the condition, and the degree of handicap did not influence significantly the scores he made on adjustment tests, the type of man or self-portrait he drew or his predominant wish.
2. The factor of sex did influence the responses a crippled child gave to the Situational Picture.
3. None of the factors studied influenced the scores mothers of crippled children made on tests, the ratings they received on rating scales, or their primary wish.
4. The factors of sex and degree of handicap did affect the acceptance-rejection of the crippled child. Girls and mildly handicapped children were more

accepted than were boys and markedly handicapped children.

The following general conclusions were upheld by the results of the study:

1. Crippled children are aware of their condition and the limitations resulting from it.
2. Deviation of adjustment and poor parent-child relationship of crippled children seem to result primarily from the fact that they are crippled. Such factors as sex, mental age of the child, age of onset of the condition and the degree of handicap have little influence on the type of personal, emotional, and family adjustment made.

267 pages. \$3.34. MicA54-1837

SEX DIFFERENCES IN THE VOCATIONAL INTERESTS OF A PROFESSIONAL GROUP

(Publication No. 8467)

Robert Lindy McCornack, Ph. D.
University of Minnesota, 1954

Major Advisor: Donald G. Paterson

The present study was undertaken to make the Strong Vocational Interest Blank a more useful tool in both the guidance and selection of potential men and women social workers. In addition, the relative merits of multiple-weight and unit-weight keys, the existence of sex differences, and the value of the double cross-validation design were investigated.

A sample of 700 men and 700 women social workers were drawn randomly from the 1952 edition of the Membership Directory of the American Association of Social Workers. The subjects were mailed a Personal Data Form, a covering letter, and a stamped return envelope. Also, 450 women and 450 men received the Strong Vocational Interest Blank appropriate for their sex. The remaining 250 women and 250 men received both the men's and women's forms of this test. Four follow-up reminders were used. Three months after the initial mailing, 87% of the group of 450 men, 89% of the group of 450 women, 84% of the group of 250 men, and 83% of the group of 250 women had responded. After a return had been received, the information available on the Personal Data Form was used to eliminate those who could not safely be considered fully qualified social workers. Nearly 19% of those responding were eliminated on this basis.

The major goal was sought by developing a scoring key that contrasted the interests of the men social workers with a group of Men-in-General, composed of men from many professions. There were 496 fully qualified men social workers.

The Social Worker key developed for the men's form of the Strong Vocational Interest Blank was highly successful in differentiating between the distinctive interests of men social workers and the interests of Men-in-General. The distinctive interests of these men were interests in verbal activities and a great interest in people.

A group of 75 fully qualified men social workers were used to cross-validate the above key. The results were completely confirmed.

The double cross-validation design proved useful in providing close estimates of the effectiveness of the scoring key so constructed. However, as close an estimate of the effectiveness of the men's key would have been available if this design had not been used. Therefore, the design offered no particular advantages.

The Social Worker scoring key developed for the women's form of the Strong Vocational Interest Blank was very successful in differentiating between the distinctive interests of women social workers and the interests of Women-in-General. Their distinctive interests were a liking for people and verbal activities, and a disliking for scientific, selling, and clerical activities. The present key was better able to identify persons who are like the members of the professional social work organization than did Strong's original Social Worker key.

Two sets of three unit-weight and three multiple-weight keys were constructed for each sex group. One set of unit-weight keys were based upon item response differences of 6% or more and the other upon 18% or more differences. In every case, the multiple-weight key was superior to the corresponding unit-weight key. However, the superiority of the multiple-weight key over the 18% unit-weight key was very slight.

The 140 men and 139 women who completed both forms of the test were used to investigate sex differences. By comparing the two forms for the same individuals, large sex differences were found in total interest patterns and in interests which distinctively characterize social workers.

184 pages. \$2.30. MicA54-1838

RELATIONSHIP OF MEASURED INTERESTS TO CAREER DATA FOR AIR FORCE OFFICERS IN THE COMPTROLLER FIELD

(Publication No. 8484)

Harry Edward Roadman, Ph.D.
University of Minnesota, 1954

Major Advisor: Kenneth E. Clark

This study began as an exploration of certain psychological aspects of members of an Air Force occupational field. 327 officers constituted a rather circumscribed, but complete, population of two Air Force Specialty groups in the comptroller field. Data were gathered by mail from these men until there was information available about 20 items of personal history and the measured interest for 243 members of this population.

The orientation toward these facts was to examine, first of all, why this group exists as such, what place it has in the larger organization of which it is a part, and something about its importance. Further, from the point of view of a psychologist, the research that seemed most relevant was: Are there any

significant relationships between the results of the psychological measuring device used here (the Strong Vocational Interest Blank) and the biographical facts for these officers; and, can there be any useful implications in these findings for the improvement of such military occupational groups?

The first research question was explored by separating the interest profiles of the 243 officers into those "like" and those "unlike" Strong's criterion group of accountants, then discovering what personal history factors were related to each group of profiles. Most of the resulting relationships were interestingly descriptive of this Air Force group, but only four highly significant relationships were discovered. Those officers with "good" accountant interest profiles showed definite evidence of: (a) having had some civilian comptroller experience, (b) having majored in fields related to comptroller if they attended college, (c) stating a preference for Air Force duty in the comptroller Specialties, (d) stating a preference to engage in Comptroller occupations in civilian life if released from Air Force duty.

These four variables were seen to be rather unique because they resembled criteria which logically might be used, and have been used by some workers, to test the usefulness or validity of the SVIB with a particular occupational group. Since "college major" information represented only a portion of the sample group, it was disregarded, but the remaining three variables were viewed from the perspective one would take in the usual predictive study, and were called criterion variables. These were discussed for adequacy as criteria, and the LIKE-UNLIKE interest profiles were compared with various combinations of these criteria. Contingent upon this criterion adequacy, and cross-validation of the results (which must await the accrual of a new group of officers in this occupational field), the conclusion was drawn that the high relationship of the SVIB results to these combined criteria supports the validity of the use of this interest inventory in any subsequent manning of this Air Force officer occupational field.

179 pages. \$2.24. MicA54-1839

SUICIDAL RESPONSES ON THE RORSCHACH TEST: A VALIDATION STUDY. PROTOCOLS OF SUICIDAL MENTAL HOSPITAL PATIENTS COMPARED WITH THOSE OF NON-SUICIDAL PATIENTS

(Publication No. 8259)

George A. Sakheim, Ph.D.
Florida State University, 1954

The Rorschach protocols of forty seriously suicidal hospitalized psychiatric patients and forty non-suicidal patients were analyzed for the presence of 42 Rorschach factors and configurations reputedly indicative of suicidal tendencies.

The two clinical groups were equated for age, sex, educational level, and general intelligence. Both groups were composed entirely of patients

suffering from functional mental disorders. Of the suicidal subjects, none had received insulin or electric shock therapy during the interval between the suicidal attempt and the time of testing. None of the controls had received any such treatment for a period of at least one year prior to testing.

A comparison of the two groups by means of Chi-Square revealed that of 27 conventional Rorschach symbols, ratios, and scoring categories only dark shock on plate IV and the number of responses in which animals behaved like humans differentiated between the two groups. These results demonstrate that a large number of standard Rorschach factors that have been interpreted in the past literature as indicative of suicidal tendencies failed to show any positive relationship to actual suicidal behavior.

Of the suicidal configurations reported by Hertz, five reliably distinguished between the two groups. These were: marked anxiety, depressed states, resignation, withdrawal, and agitation. Two others, neurotic structure, and sudden and/or inappropriate outbursts, bordered on statistical significance. By applying the configuration technique described by Hertz, it was found that 87% of the suicides and 27% of the non-suicides gave five or more suicidal configurations. However, 12% of definitely suicidal patients were missed with this technique. Six or more of Hertz's configurations were given by 60% of the suicides and only 10% of the controls.

When an abbreviated form of Hertz's method was attempted, in which only the seven most valid configurations were utilized, it was found that 70% of the suicides and 15% of the controls showed four or more of seven suicidal configurations.

Present evidence supports the conclusion that only the configuration technique developed by Hertz proved to have any considerable validity in the accurate diagnosis of suicidal behavior. It alone was consistently successful in screening out the suicidal patients from a group of hospitalized psychiatric patients in general. One limitation of this technique is that the user is likely to misdiagnose from 10% to 27% of non-suicidal subjects as suicidal.

An analysis of certain commonly accepted indicators of hostility on the Rorschach disclosed that hostile impulses were not revealed with any greater frequency by the suicides than by the non-suicidal controls. This suggests the conclusion that suicides are no more hostile than are mentally ill patients in general. Therefore, the psychoanalytic dictum which holds that suicide is a form of self-aggression, or aggression directed toward others that has been blocked and turned inward against the self was not corroborated.

60 pages. \$1.00. MicA54-1840

PSYCHOLOGY, CLINICAL

REGIONAL DIFFERENCES IN OCCUPATIONAL INTERESTS

(Publication No. 8615)

William Frederick Braasch, Jr., Ph. D.
Columbia University, 1954

The measured interests of a group of mathematics-physical science teachers, social science teachers, and pharmacists from the North were compared with those of similar groups from the South. Completed Strong Vocational Interest Blanks were obtained from 100 Southern and 313 Northern pharmacists; 100 Southern and 95 Northern mathematics-physical science teachers; 97 urban Southern, 64 rural Southern and 90 Northern social science teachers. All of the subjects had been in the occupation for at least the past three years and were under 60 years of age.

The significance of the differences between the mean scores for each occupational scale and the three special scales were obtained by comparing the various regional groups, and the rural and urban Southern groups. The new groups and old (criterion) groups were similarly compared on their own scales. An item analysis was made to determine the differences of the various groups.

The hypothesis that the interest scores of social science teachers would show significant differences when groups consisting of members of the occupation selected from two different regions were compared was substantiated. The social science teachers did not differ on their own occupational scale but they did differ on other scales.

The hypothesis that the interest scores of mathematics-physical science teachers and of pharmacists would not differ significantly when groups consisting of the members of each occupation selected from two different regions were compared was not substantiated. The mathematics-physical science teachers did not differ on their own occupational scale but they did differ on other scales while the pharmacists differed on their own scale as well as other scales.

The social science teachers from the North, from the urban South, and from the rural South did not differ significantly from one another on the Social Science teacher scale. The rural Southern teachers scored higher on the typically rural occupations, as well as on those involving manual skills, while the urban teachers tended to score higher on the professional occupations requiring a higher degree of verbal facility. The social science teachers from the North scored higher on scientific occupations while the social science teachers from the South scored higher on occupations that involved dealing with people.

The mathematics-physical science teachers from the North scored higher on the psychologist, certified public accountant, public administrator, and mathematician scales while the science teachers from the South scored higher on the life insurance salesman and veterinarian scales.

The mathematics-physical science teachers from the North and from the South, and the social science teachers from the North, differed significantly from their respective criterion groups which were established prior to 1938. The evidence does not warrant the restandardization of the teacher scales but does indicate that the pharmacy scale, established in 1947, should include in the sample pharmacists from other regions. 88 pages. \$1.10. MicA54-1841

FLICKER FUSION THRESHOLD AND ANXIETY LEVEL

(Publication No. 8620)

Robert Adolph Buhler, Ph. D.
Columbia University, 1954

The present experiment attempted to clarify the relationship between flicker fusion thresholds (FFT) and anxiety level. The literature suggested that anxiety lowers FFT. However, the findings have not been altogether consistent. The discrepancies may not be fundamental, owing to marked differences in experimental procedure and rigor.

The research design employed in this study conformed to the traditional experimental approach. It used a psychophysical measurement, (FFT), to evaluate the effects of a single, independent variable, (anxiety), in a highly controlled setting. It was felt that a longitudinal study of changes in anxiety in experimental and control subjects would provide an appropriate experimental design for evaluating the relationship between FFT and anxiety level.

The experimental group consisted of hospital patients who were tested twenty-four hours prior to minor surgery and then retested upon recovery from their illness. The assumption was made that patients would be relatively more anxious prior to surgery than after surgery. The control group was composed of hospital employees who were tested and later retested at approximately a one week interval.

Control over the many extraneous factors known to influence FFT was accomplished by the careful application of rigorous selection criteria.

The testing procedures included FFT determinations, systolic blood pressure measurements, and self ratings on a manifest anxiety inventory.

The following conclusions were drawn:

1. FFT is a valid, sensitive index of anxiety level.
2. FFT is a highly reliable measurement.
3. Increases in psychological stress and anxiety tend to lower FFT markedly.
4. Increases in psychological stress and anxiety are accompanied by significant increases in the intra-individual variability of FFT.
5. The two physiological correlates of anxiety (blood pressure and FFT) show moderate negative correlations.
6. FFT has a potential usefulness as a screening device for the differentiation of anxious from non-anxious persons.

That the FFT is a simply obtained, objective, reliable measurement which is sensitive to anxiety level has been established. It appears that the research applications of FFT in the areas of psychotherapy and psychopathology would be fruitful, and would lead, perhaps, to further testable hypotheses concerning the generalization of perceptual attitudes and the relationships between personality and perception. 54 pages. \$1.00. MicA54-1842

THE FORMATION AND RECALL OF ASSOCIATIONS AS A FUNCTION OF SYLLABLE FAMILIARITY AND FREQUENCY OF PAIRING

(Publication No. 8782)

Bonnie Webb Camp, Ph. D.
Indiana University, 1954

This paper presents an attempt to determine the effect of variation in three aspects of a learning situation on the responses obtained by the association method. Stimulus familiarity, response familiarity and frequency of paired occurrence of nonsense syllables were varied independently by presenting varying numbers of stimulus syllables (S), of response syllables (R), and syllable pairs (S-R) to 135 undergraduates with instructions to copy the syllables as they were exposed. The effect of these variables on a) the responses of subjects in a word association situation and b) the retention of these responses was determined by presenting each of the S syllables to the subjects twice, first with instructions to write the first other syllable that occurred to them and following this with instructions to reproduce their previous responses.

The following relationships were observed:

1. As R syllable familiarity increased, more subjects gave higher frequencies of R syllable associations and fewer subjects gave high frequencies of S syllable associations.
2. As S syllable familiarity increased, significantly more subjects gave higher frequencies of S syllable associations.
3. Subjects unequally familiar with S and R syllables tended to associate the more familiar syllables more frequently. Subjects equally familiar with S and R syllables gave more S syllable associations than R syllable associations when there were no trials with the S-R pairs, and more R than S when pairing was introduced.
4. As frequency of pairing increased, significantly more subjects gave higher frequencies of R syllable associations and lower frequencies of S syllable associations. More subjects gave higher frequencies of correct associations as frequency of paired presentations increased.
5. Correct recall varied with variations in the degree of familiarity with R syllables. There was also a significant, positive rank order correlation between the number of correct

associations and the number of associations correctly recalled.

It was concluded that determinants in the original learning process of the responses obtained by the association method can be studied directly. Further, the variables studied here, stimulus familiarity, response familiarity and frequency of paired occurrence are partial determinants of these responses and to some degree, of the retention of them.

45 pages. \$1.00. MicA54-1843

AN EXPLORATORY STUDY OF CREATIVITY IN TERMS OF ITS RELATIONSHIPS TO VARIOUS PERSONALITY AND INTELLECTUAL FACTORS

(Publication No. 8517)

John E. Drevdahl, Ph. D.
University of Nebraska, 1954

Adviser: Don W. Dysinger

The purpose of this study was to explore some of the proposed relationships between creativity and various intellectual and personality characteristics.

The subjects (64 persons) were volunteers from among advanced undergraduate and graduate students in the various science and arts departments at the University of Nebraska. The raters were members of the faculty of the University of Nebraska who were well acquainted with the subjects, familiar with evaluative procedures, and accustomed to functioning in areas in which creativity is frequently revealed. They were, therefore, likely to be sensitive to signs of the presence of creative potential. Each subject was rated independently by at least two judges. The inter-judge reliability coefficient was .71. The agreement between the judges' subjective definition of creativity and the experimental definition is shown in the interdefinition reliability coefficient of .99.

A series of tests designed to measure a variety of intellectual and personality characteristics was administered. These were several of Guilford's creativity factor tests, Thurstones' Primary Mental Abilities Test, and Cattell's Sixteen Personality Factor Questionnaire. The subjects were divided into creative and non-creative groups on the basis of their creativity ratings. Differences between creative, non-creative, science, and arts groups were investigated by means of an analysis of variance technique, and the relationships between creativity and the intellectual and personality characteristics were determined by the use of biserial correlation coefficients.

The results of this investigation suggest the following conclusions: There seem to be few significant differences between creative persons in the sciences and in the arts on the commonly accepted factors that comprise general intelligence. Creativity does not seem to be related to general intelligence in the experimental population (a group of superior intelligence). Creative persons appear to be significantly superior to non-creative persons in their verbal

fluency, flexibility and originality. Creative persons appear to be somewhat more withdrawn and quiescent as well as more sophisticated, radical in their social views, and self sufficient than non-creative persons. Creative artists were considerably more self sufficient and radical in their social views than creative scientists or non-creative individuals in either the sciences or the arts. Apart from their classification as creative or non-creative, the arts groups were significantly less stable and controlled, more sensitive emotionally, and more insecure and tense than the science groups. The arts groups also tended to be more egocentric and "bohemian" than did the science groups. The group of subjects employed in this study differed from the normal standardization population on the Sixteen Personality Factor Questionnaire in being more mature, altruistic, and self confident. There were no other marked personality differences between the experimental groups and the normal population.

Further investigation into the techniques of test construction and into the development of more refined scoring procedures on tests of the intellectual factors that may be involved in creativity is needed and an extension of this type of investigation to larger and more variable populations seems desirable. Finally, an investigation of the effect of motivational factors on creative effort, would be a study of considerable importance.

113 pages. \$1.41. MicA54-1844

BEHAVIOR IN A LEVEL OF ASPIRATION SITUATION AS AFFECTED BY GROUP COMPARISON

(Publication No. 8451)

Albert Stanley Dreyer, Ph. D.
University of Minnesota, 1954

Problem

To investigate the effects of (a) induced pre-performance expectations of success and failure, relative to a fictional group average, on aspiration behavior (b) pressure toward uniformity, created through performance markedly above or below a fictional group average, on when an activity will be stopped.

Design and Sample

1. Sample: To study these effects, a homogeneous group was selected. The subjects were 120 boys in the sixth grade with average intelligence and socio-economic status and who had adequate school success. Mean CA 11-10. Mean Otis IQ 102.

2. Design: A simple card-sorting task was used. Two conditions of pre-performance expectation (High and Low) were generated through appropriate instructions. Three performance groups (High, Middle, and Low) in each expectancy condition were created through pre-arranged scores. Twenty subjects were randomly assigned to the six experimental groups possible. The subjects were allowed to stop the task at any point they desired in the series of

trials. Before each trial, they were asked for a statement of the number of cards they were going to try to get. To obtain a measure of their actual performance, the actual time in seconds to perform each trial was recorded. To obtain a measure of their subjective feelings about their performance and the test itself, a rating scale was administered after the test situation.

Results

1. A pre-performance expectation of success, relative to a fictional group average, produced a higher initial level of aspiration than a pre-performance expectation of failure. The aspiration statements of the subjects in the High Expectancy condition were all above the fictional group average and the aspiration statements of the subjects in the Low Expectancy condition were all below the fictional group average before the subjects gained experience with the task.

2. Pre-performance expectation of success produced higher levels of aspiration with experience but in only the Middle Performance groups was the difference significant. It was concluded that the Middle Performance groups were the only groups competing against the fictional group average presented.

3. Expectation and performance in opposite directions produced greater variability in aspiration levels.

4. The predictions concerning stopping were only partially confirmed. Both High Performance groups stopped significantly sooner than the Low Performance groups. There was no significant difference between the Middle and Low Performance groups in when they stopped. A drive for improvement was hypothesized to account for this failure to obtain full confirmation of the stopping predictions.

5. The actual performance of the subjects was unaffected by the success or failure experience.

6. Rated feelings of success or failure were more pronounced in the Middle Performance groups. This was concluded to be additional evidence that the Middle Performance groups were the only ones actually competing against the fictional group average.

Practically all the subjects showed a high personal involvement in the task on their ratings. Significantly more Low Performance subjects blamed the test rather than themselves for their poor performance on their ratings. The ratings concerning the relation between success and failure experiences and renewed striving were inconclusive.

Significantly more High and Low Performance subjects rated the performance of their "friends" closer to their own level of performance.

122 pages. \$1.53. MicA54-1845

VOCATIONAL INTEREST - ACHIEVEMENT - ABILITY: INTERRELATIONSHIPS AT THE COLLEGE LEVEL

(Publication No. 8455)

Vivian Humphrey Hower, Ph. D.
University of Minnesota, 1954

Major Advisor: Donald G. Paterson

This study evaluated the interrelationships between vocational interest, achievement, and ability at the college level. More specifically, it was a study of the use of the Strong Vocational Interest Blank, SVIB, for prediction of college achievement as measured by grades. Since ability is so strongly related to academic achievement and might obscure any contribution measured vocational interest is making to the prediction of that achievement, the effect of the ability factor was controlled.

The sample consisted of 296 pre-medical students entering the University of Minnesota in the fall quarters of 1949, 1950 and 1952. Students in the pre-medical rather than the medical curriculum were chosen so as to increase the heterogeneity of the group on the variables studied and to decrease as much as possible the motivation of these students to fake on SVIB.

The first part of the study was concerned with zero order correlations of the five predictors, American Council of Education Psychological Examination, Ohio State Psychological Examination, Physician key on the Strong, Cooperative English, and high school rank with the criterion, first quarter pre-medical honor point ratio. Intercorrelations between the predictors and a multiple correlation and multiple regression equation were calculated. Samples from the three years were combined after appropriate tests revealed that the variances were homogeneous and that there were no significant differences in the means for all variables. The Strong and the English made no significant contribution to the multiple correlation of .67. The final regression equation was

$$Z = .3513X_2 + .0081X_3 + .0100X_4 - 1.9488$$

where Z = predicted first quarter pre-medical honor point ratio, X_2 = transformed high school rank, X_3 = ACE raw score, and X_4 = Ohio raw score.

In the second part of the study, ability was controlled experimentally. The method was to determine whether at a given ability level, there was a significant difference in mean honor point ratio for first quarter pre-medical students whose interests strongly resembled those of successful physicians as contrasted with those whose interests were dissimilar to those of successful physicians. In those instances where the number of cases was large enough, F-tests and t-tests were used to test the significance of the difference. Differences in honor point ratio were considered positive when students with interests like physicians made the better grades. The majority of the differences were negative, and only two were significant, one at the 5 per

cent level, the other at the 10 per cent level, and both negative. No evidence was found that at a given ability level pre-medical students with high scores on the Physician key of SVIB will get better grades than those with low scores in their first quarter of pre-medical training.

In the final test, differential grades in two contrasting courses (such as zoology minus social science) were correlated with score on the Physician key. Ability to get grades would thus be controlled, and differences might, therefore, be clearly due to interest. Several combinations were tried but only two were found which were significant at the 5 per cent level. These were

zoology HPR - social science HPR vs.
Physician key = +.21
chemistry HPR - social science HPR vs.
Physician key = +.21

These correlations are too small to be of value in prediction.

In general, there was no evidence from this study that for a group of pre-medical students a measure of vocational interest such as SVIB can be used to predict academic achievement in the first quarter of pre-medical training. This is true when ability is controlled experimentally. It is also true when ability is controlled by measures of differential achievement.

161 pages. \$2.01. MicA54-1846

THE INFLUENCE OF ANXIETY AND TASK COMPLEXITY ON THE LEARNING OF CONCEPTS

(Publication No. 8522)

Jack Denton Holbrook, Ph.D.
University of Nebraska, 1954

Advisor: Marshall R. Jones

The study of anxiety and its effects upon human learning have aroused considerable interest in contemporary psychological theory and research. Recently, anxiety has been regarded as an internal drive state, capable of energizing responses associated with its arousal. According to this view, increasing anxiety retards learning if the task has numerous competing responses relative to the correct response, and facilitates it when there are few or no such competing responses. Corroboration of this viewpoint has been obtained by studies on the effects of anxiety upon performance in simple conditioning, serial rote learning, verbal learning, maze learning, and stimulus generalization. To date, no attempt has been made to apply this view to the study of concept learning.

The purpose of the present investigation was to determine the influence of anxiety and task complexity upon the learning of concepts. Sixty college freshmen women, ages 17-19, were selected on the basis of their having obtained either extremely high

or extremely low scores on a scale of manifest anxiety. Thirty of these subjects received instructions which were assumed to be anxiety-arousing, and thirty subjects received instructions which were assumed to be neutral. The concept learning tasks were made more complex by increasing the number of common English words on the front of the cards confronting the subjects. Subjects were required to select a key word, which was an instance of a concept as represented by a nonsense syllable, from two, four or eight words. Twenty subjects performed the task which required them to select a key word from two possible words; twenty subjects performed the task requiring them to select the key word from four possible words; and twenty subjects performed the task requiring them to select the key word from eight possible words. Each task required the subjects to learn six concepts to the criterion of one errorless trial. After the subjects had attained the criterion, they were interviewed and they rated themselves on the degree of discomfort they experienced during the anxiety-arousing or neutral period.

Results indicated that high manifest anxiety subjects performed better on the two less complex tasks but less well on the most complex task, in comparison with low manifest anxiety subjects. No statistically significant effects upon the learning of concepts were observed concerning the differential instructions. The results were discussed in terms of discrimination learning being influenced by different strengths of the anxiety drive, and were considered to be consistent with the theoretical formulation outlined earlier. It was also suggested that the inefficient concept learning of psychopathological subjects might be understood on the basis of high anxiety in these subjects and the complexity of the learning material.

The following conclusions were drawn: (1) The learning of concepts is both quantitatively and qualitatively influenced by increasing the difficulty in the discrimination learning phase of learning concepts. (2) The learning of concepts is significantly influenced by the general level of excitability or drive of the subjects, although the direction of this influence (facilitative or interfering) depends upon the complexity of the task. (3) Different methods of measuring anxiety, such as the ones employed in the present investigation, tend to result in differential effects upon performance in the learning of concepts. (4) The motivational level of the organism, defined in terms of anxiety as drive, significantly influences the formation of concepts. Before any thorough theory of cognition is formulated, the motivational level of the organism and its effects upon concept learning must be taken into consideration.

126 pages. \$1.58. MicA54-1847

MMPI PROFILE PATTERN AND SCALE
STABILITY THROUGHOUT FOUR YEARS
OF COLLEGE ATTENDANCE

(Publication No. 8469)

William Willis Mills, Ph. D.
University of Minnesota, 1954

Adviser: Walter W. Cook

The increasing use of the Minnesota Multiphasic Personality Inventory (MMPI) with college students and the acceptance of the results of a prior single administration of the inventory as substantially representative of the personality status of the student at a later date gave rise to this investigation's purpose of determining the extent to which prior scale scores and patterns persist throughout four years of college, especially the first two years. The MMPI pattern referred to is specified by the T-scores of these nine clinical scales: D, Hy, Mf, Pa, and the five K-corrected scales (Hs, Pd, Pt, Sc, and Ma). The booklet form was used.

Some of the major hypotheses were these: H1. There is a set of items on a prior MMPI that is significantly related to the amount of subsequent profile pattern stability. H2. Profile pattern stability or change is a persisting characteristic of the retest behavior of certain students. H3. Students tend to maintain their relative positions on MMPI scales throughout extended periods of time, i.e., 19 and 44 months. H4. There are developmental levels on MMPI scales that are characteristic of different temporal stages in the progress of students through the college studied.

The subjects were all students at a metropolitan liberal arts college (total enrollment - 1700) where all were required to take the MMPI as entering freshmen. Procedure and sample diversification were intricately interwoven as follows:

SD (Scale Derivation groups) - 140 women and 99 men who were required to take MMPI in Sept. 1947 and again as sophomores in April-May 1949.

ITV (Intertemporal Validation groups) - the 45 women and 28 men of the Scale Derivation groups who volunteered to take a third MMPI as seniors in May-June 1951.

CV (Cross Validation groups) - 59 women and 40 men who were required to take the MMPI as freshmen in Sept. 1951 and volunteered to take it again in May-June 1952.

All statistical analyses were made separately for the sexes. An Index of Profile Pattern Dissimilarity (Dp) was developed as a criterion of pattern stability.

The findings relevant to the hypotheses stated above were as follows:

H1. An item analysis resulted in two Profile Pattern Stability Scales (Ps), one for women and one for men. The correlation of Ps1947 x Dp1947-49 for the SD women was .57; for the SD men, .56. In the case of the ITV women, Ps had significant predictive power for independent and longer

time intervals, i.e., $r \text{ Ps49} \times \text{Dp49-51} = .36$ ($P = .02$) and $r \text{ Ps47} \times \text{Dp47-51} = .42$ ($P < .01$). Ps had no significant predictive power for the CV women, the ITV and CV men.

H2. Pattern stability or change was found to be a persisting characteristic of both the ITV women and men. For the women, $r \text{ Dp47-49} \times \text{Dp49-51} = .40$ ($P < .01$); for the men, $r \text{ Dp47-49} \times \text{Dp49-51} = .54$ ($P < .01$).

H3. For the SD groups, all the correlations of the 1947 x 1949 MMPI scale scores differed significantly from zero ($P < .01$), ranging for the women from .37 (Sc) to .59 (Mf), for the men from .27 (Hs) to .61 (Ma). For the smaller ITV groups, the majority of the correlations of the 1947 x 1951 (44 months) scores were significant.

H4. For the SD women, the mean T-scores on Pt, Sc, and Ma were significantly higher on the 1949 (second) administration. For the SD men, the mean T-score of Pa was significantly lower on the 1949 administration. None of these differences was as great as 3 T-score points.

105 pages. \$1.31. MicA54-1848

THE PREDICTION OF EXPRESSED
ATTITUDES TOWARD THE MOTHER

(Publication No. 8407)

Alzire Sophia Block Segal, Ph. D.
University of Michigan, 1954

The problem facing psychologists today of predicting reality behavior is essentially related to the unsolved problems in ego psychology. Foremost among these problems is the detection of the variables which effect an individual's adaptation to a need. The concept of defense offers a mode of approach to this particular problem. The present study represents a phase in a research program and is concerned specifically with the effect of defensive reactions on drives, or underlying forces.

The point of departure for this study is the psychoanalytic formulation that behavior is the resultant of the interplay of drives and defenses. The attempt was to predict actual behavior by knowing an individual's underlying drives and by knowing his characteristic mode of defending himself against unacceptable drives. A model situation was designed to test the accuracy of predictions made on this basis. This was the feelings toward the mother that would be expressed in an interview by girls who had similar strengths of hostility or dependency drives toward the mother, but who utilized different defense mechanisms. In addition, an exploratory study was made of the feelings that would be expressed by girls who had similar defensive reactions but who had differing strengths of hostility or dependency drives toward the mother.

The measure of defense was the Defense Preference Inquiry, an instrument designed by Goldstein.

Measuring the consistency of preference for particular defense mechanisms, the DPI determines whether an individual is a specific or general defender. The latter is one who shows a rigid preference for a particular defense mechanism in an anxiety situation, while the former uses several defenses flexibly. Drives of hostility and dependency toward the mother and their strength were determined by analysis of stories told to selected TAT cards and Blacky Pictures.

A large group of female college students was given the DPI and selected Blacky and TAT pictures to determine those who fulfilled the requirements of being general defenders with strong drives, specific defenders with strong drives, and specific defenders with weak drives. There were sixty-one girls chosen as subjects for the experiment. Each subject was interviewed by the same person in an interview in which the questions were designed to elicit feelings of hostility or dependency toward the mother.

The results confirmed the major hypothesis that the general defender would express less feelings of hostility or dependency toward the mother than the specific defender. In accord with the predictions the general defender required more stimulation before responding with expressions of hostility or dependency. The general defenders expressed less of their feelings when the situation was ambiguous as well as when it was well-structured. The results failed to confirm the hypothesis that the general defender, when verbalizing any feelings, would express them less forcefully than those expressed by the specific defender. Finally, the general defenders did not verbalize their responses in a manner characteristic of their preferred defense mechanism.

In the exploratory study it was found that specific defenders with weak drive expressed less of their feelings than those with strong drive. Those with weak drive appeared to be like the general defenders in not expressing much of their feelings.

Additional findings include the greater likelihood of the specific defender to be the oldest child in the family and to have a relatively younger mother than the general defender. There was no relationship between being an only child or having siblings and defender type. Individuals with strong drives of dependency toward the mother were younger than those with weak drives.

From all these results the conclusion is drawn that defense is a crucial variable which must be taken into consideration when attempting to understand and predict behavior, and that the strength of the drive also must be taken into account. It was also concluded that the Defense Preference Inquiry has predictive validity since it enabled the selection of general and specific defenders, who were then found to be distinguished according to behavioral criteria.

123 pages. \$1.54. MicA54-1849

THE RELATION OF CERTAIN ASPECTS OF ANXIETY TO PERFORMANCE ON THE BENDER VISUAL-MOTOR GESTALT TEST

(Publication No. 8413)

Edna Elizabeth Slocombe, Ph. D.
University of Michigan, 1954

This study considers the possible use and limitations of the Bender Visual-Motor Gestalt test as a measure of certain aspects of anxiety in normal adult subjects. This test is regarded in this study essentially as a sample of motor-perceptual behavior which might be expected to reflect behavioral changes of the organism due to anxiety.

The subjects in this study were 156 graduate clinical psychology students to whom the Bender test and the Minnesota Multiphasic Personality Inventory were administered in Veterans Administration Assessment programs. The subjects were divided randomly into an experimental group and a cross validation group. Two criteria of anxiety were used: the first criterion was the combined scores on the Taylor Scale of Manifest Anxiety and the Winne Scale of Neuroticism, by which subjects were designated high, middle, and low anxiety subjects; the second criterion of anxiety was a ratio of the degree of expressed anxiety to the degree of repressed anxiety by which subjects were designated as expresser or represser subjects. A semi-objective scoring system based on 95 aspects of the subjects' reproductions of the test figures was developed. As an initial validation the differences in incidence of these measures between high and low anxiety subjects and between expresser and represser subjects were tested for significance in the experimental group. Measures discriminating at the .05 level of significance were checked on the cross validation group and also combined into a total score for the cross validation group. The results were compared with those obtained with scoring systems developed by Pascal and Suttell, Billingslea, and Gobetz for discrimination between normal and neurotic subjects and also compared with indicators of anxiety proposed by Hutt.

None of the 95 measures of Bender performance discriminated significantly between high and low anxiety subjects in both experimental and cross validation groups. Two measures discriminated significantly between expresser and represser subjects in both groups. These two measures pertained to the size of reproductions of test figure 7 which was analyzed for possible meaning to these subjects either in regard to their conflicts or in relation to the test situation. Means of total scores on the cross validation group did not discriminate between high and low anxiety subjects but discriminated between expresser and represser subjects at the .05 level of significance.

Individual measures found significantly discriminating between normal and neurotic subjects by Pascal and Suttell, Billingslea, and Gobetz did not discriminate between high and low anxiety subjects in this study but showed a slight tendency to discriminate

between expresser and represser subjects. Indicators of anxiety proposed by Hutt showed slight but not significant differences between both criterion groups.

Marked but similar deviations from the stimulus figures were characteristic of the reproductions by subjects in all criterion groups, so that drawings of different criterion groups often tended to be more like each other than like the stimulus.

These results suggest that, while the Bender test may be of some value in determining group differences in ways of handling anxiety by expression or repression, its value is dubious as a technique for assessing the level of anxiety in normal subjects. It is also possible that differences found in this study are significant only for this test situation and the conflict area to which these subjects may be sensitive. The general conclusion from the evidence available in both this and related studies limits the use of the Bender test to screening groups of subjects or estimating group differences. Even in estimating group differences, overlap between groups is large and the cost prohibitive unless equally valid results can be shown for records obtained with group administration of the test.

152 pages. \$1.90. MicA54-1850

PSYCHOLOGY, EXPERIMENTAL

RESPONSE RATE AND RESISTANCE TO EXTINCTION AS FUNCTIONS OF THE FIXED RATIO

(Publication No. 8609)

John Jay Boren, Ph. D.
Columbia University, 1953

The problem of this study was to determine the effect of fixed ratio schedules of reinforcement upon two measures of response strength: resistance to extinction and response rate. Two experiments were performed with male albino rats in the Skinner box apparatus.

In Experiment I each of six groups of animals was trained under a different fixed ratio schedule and then extinguished. It was found that as the fixed ratio increased, the resistance to extinction increased. The form of the relation was approximately linear. The results were interpreted as being consistent with both the Mowrer-Jones response unit theory (provided the amount of effort was considered) and the generalization decrement hypothesis.

In Experiment II a single group of animals was trained on several fixed ratio schedules until a stable rate of responding was established. The results showed that the average rate, the break in responding after a reinforcement, and the corrected rate (computed by subtracting out the breaks) increased as the fixed ratio increased. When the animals were shifted from a large ratio to a smaller one upon

which they had been previously trained, the average rate was the same as previously, but the break was longer, and the corrected rate was higher. The results of this experiment were related to Skinner's analysis of fixed ratio, and several explanations were advanced to account for the functional relations found.

33 pages. \$1.00. MicA54-1851

THE LEARNING AND RETENTION OF NEUTRAL MATERIALS AS A FUNCTION OF THE VALUES OF THE CONTEXTS IN WHICH THEY APPEAR DURING LEARNING

(Publication No. 8520)

Eugene Ernest Gloye, Ph. D.
University of Nebraska, 1954

Adviser: Katherine E. Baker

The controversial problem of the influence of affective value upon learning and retention is here studied with a new methodology which: (a) defines value in terms of differential associated reward and punishment, allowing for "building-in" values during the experiment; (b) separates affectively valued contexts from neutral learning material itself; (c) measures effects of valued contexts upon learning and retention; (d) controls for over-learning effects upon retention; (e) compares retention with and without contexts present during learning.

Forty-eight subjects first played a "gambling" game with cards containing ten geometrical outline figures each of which was worth plus five, plus one, zero, minus one, or minus five pennies. Next, the figures were used in a non-serial paired-associate learning task where a three-digit number appeared within each, the figures now acting as valued surrounds or contexts. Numbers were learned as responses to nonsense syllables and the number-figure relationship was not essential to learning. Each item was learned to a criterion of two correct anticipations, the separate items being dropped from the list as soon as the criterion was met, thus eliminating over-learning.

Two recognition tests given in counterbalanced order measured retention three and seven days after learning. Subjects attempted to recognize the ten numbers randomly placed within a list of thirty numbers presented once without any context figures and once with context figures. In the later test five learned numbers appeared in their original contexts and five appeared in contexts of reversed values. Total frequencies of recognition of equally well learned numbers could be compared for the effects of (a) sign and amount of value of original context, (b) presence of context, (c) changed number-context relationship.

For the group of subjects considered as a whole, the results of the study support the hypothesis that affective value influences both learning and retention. Employing the number of trials required to learn each of the three-digit numbers as an index of

learning was reduced to a statistically significant degree when valued (in contrast to neutral) contexts surrounded learning materials. Total frequency of recognition reflects a general tendency for differential retention to be a decreasing function of the value of contexts, when the original context figures are present in the recognition test. That is, with original context, value influence was indicated, while when materials appeared in new contexts and without contexts no influence was indicated. Further, errors in recognition reflect the same relationship to context value as do learning and correct recognition in original context.

While all subjects did not show value influence in learning and correct recognition, there is evidence that values did influence incorrect recognition performance for all subjects, a fact which suggests that the "building-in" procedure employed to establish values was universally effective. Thus differences among subjects can not be entirely explained on the basis of the differential efficiency of initial value development.

The results support the conclusion that values (as defined here) act as interfering elements in learning and retention. On the average items appearing in neutral contexts were learned and recognized better than items appearing in valued contexts. No evidence exists for the emphasis principle on the basis of which it would be predicted that value increases efficiency, nor is there support for the need-reduction principle (along with the Freudian repression hypothesis) on the basis of which it would be predicted that positively valued items are learned easier and retained better than negatively valued items. The findings suggest further research directed toward the problem of value as an interfering factor.

88 pages. \$1.10. MicA54-1852

AN EVALUATION OF NAVAL AVIATION CADET SELECTION MEASURES USING MULTIVARIATE DISCRIMINATORY STATISTICAL TECHNIQUES

(Publication No. 8463)

Robert Frank Lockman, Ph. D.
University of Minnesota, 1954

Co-Advisors: James J. Jenkins
Donald G. Paterson

The Problem

The purposes of the thesis were (1) to determine how well Naval Aviation Cadet Selection measures multivariately differentiate successful from attriting cadets in the Naval Air Training Program and (2) to determine the predictive efficiency of the selection measures considered multivariately.

Sampling

A population of 1685 selected cadets who entered training during 40 successive weeks was randomly

divided into halves labeled the Odd and Even samples. Three criterion categories were established within each sample: success, flight failure, and voluntary withdrawal. The end of the Primary phase of flight training constituted the point where individuals were classified into these categories.

Measurements

Five selection measures were employed to discriminate criterion groups and to predict criterion group membership for individuals. These were the Aviation Classification Test (ACT), Mechanical Comprehension Test (MCT), Flight Aptitude Rating (FAR), age in months, and amount of education beyond eighth grade.

Methods and Procedures

The basic multivariate discriminatory techniques used were the generalized distance function and the linear discriminant function. Tests of their assumptions and significance were made. Multiple biserial correlation and a test of the significance of components of dimensional variation were also employed.

Results

The Odd sample was used for the initial analyses. Available tests of assumptions necessary though insufficient to demonstrate multivariate normality showed that all distributions of variables were similar in form within and between criterion groups; homogeneity of variances, intercorrelations, and regression slopes generally prevailed throughout the groups. Wilks' Lambda criterion test showed that the criterion group means differed significantly overall groups considered simultaneously.

The generalized distance statistic discriminated both attrition groups taken individually from the successful group but not between attrition groups. Therefore, flight failures and voluntary withdrawals were pooled and analyses made with a pass-attrite criterion.

MCT, FAR, and Age proved to be significant intergroup discriminators, and ACT and Education were dropped. The linear discriminant function was calculated for the significant variables. The multiple biserial correlation coefficient was .25 with negligible expected shrinkage.

Parallel multivariate analyses were made on the Even sample with a pass-attrite criterion. To retain comparability with the Odd sample for double cross validation, ACT and Education were eliminated. Otherwise, statistical results were similar to those obtained on the Odd sample, except that the multiple biserial coefficient was .34.

Criterion groups in both samples were significantly heterogeneous with respect to the discriminant function; therefore, the discriminant weights obtained were acceptable for empirical use. The reliability of the function was about .90 in both samples.

In double cross validation, Odd sample discriminant weights predicted 56% correctly in validation

and 59% correctly in cross validation. Even sample discriminant weights predicted 61% correctly in validation and 60% correctly in cross validation. Both sample and group frequencies of correct predictions were significantly better than chance expectation. Differences between proportions of correct predictions were not significant either between criterion groups in cross validation or between samples in validation and cross validation.

An analysis of dimensional variation between criterion groups in the Odd sample indicated that MCT contributed the only significant component. Age contributed a minor component, but the FAR component was negligible.

Conclusions

The results were considered promising in view of the individual nature of predictions, large criterion group overlap, and few significantly discriminating variables with restricted ranges. Under more favorable circumstances, the distance and discriminant functions could be expected to differentiate and predict even more effectively.

181 pages. \$2.26. MicA54-1853

LEARNING THEORY AND INDUCED ANXIETY IN THE RAT

(Publication No. 8466)

Boyd L. Mathers, Ph. D.
University of Minnesota, 1954

A review of previous work on induced anxiety (fear) indicated a paucity of information on several variables which are believed to have an influence. Three of these were selected and combined into a factorial design for the present study. Three levels of primary drive and two each of AIS level and number of trials were used.

The experimental procedure was divided into four phases in which: (a) shock, anxiety, and wheel turning were paired; (b) the neutral stimulus (AIS) and anxiety were paired; (c) step (a) was repeated; (d) the AIS was presented and could be shut off by wheel turning. Cessation of the AIS was now accompanied by reduction of anxiety which had been conditioned to it in step (b).

Response amplitude, response latency, and resistance to extinction were used as response measures. The level of primary drive (shock) and level of the anxiety inducing stimulus (AIS) proved to be significant on two different response measures. Also, the significance of these variables was found to be somewhat dependent upon the manner in which they were combined with each other and with the trials variable, as indicated by the significant interactions.

It is suggested that the ability which a neutral stimulus acquires to bring about the drive stimulus (S_D) of the original trauma is by means of an anticipatory response (r). And further, that different levels of shock, in the present experiment, produce

quantitatively different anticipatory responses which are conditioned to the neutral stimulus.

A tentative explanation is given for the lack of significance obtained on the trials variable. An overview of several studies seems to indicate that the relation between a response measure and number of trials for a given shock level is curvilinear. Also, that the slope and points of inflection vary with different levels of shock.

Clinically, the data indicate that the characteristics of anxiety supported responses (symptoms) are related to the intensity of the primary drive (trauma), and also to the level of existing stimulation.

Additional experimentation should be undertaken to seek out the effect of these experimental variables on anxiety (fear) in a variety of situations, e. g., a modification of the Estes and Skinner procedure (7). More work is also needed to work out the relation between trials and shock level. This would be especially clear if a method could be devised for measuring the amount of anxiety (fear) present independent of an instrumental response.

73 pages. \$1.00. MicA54-1854

EFFECT OF EXTINCTION OF DIPPER APPROACHING ON EXTINCTION OF DIPPER APPROACHING AND BAR PRESSING

(Publication No. 8794)

Stanley C. Ratner, Ph. D.
Indiana University, 1954

The present study was designed to investigate two problems involving rats which were trained to press a bar and approach a dipper for water. Specifically, the problems were: (1) what happens to bar pressing and dipper approaching responses when both are extinguished simultaneously, and (2) what is the effect of previous extinction of the dipper approaching response on the extinction of both bar pressing and dipper approaching responses.

Seventy-two water deprived rats were trained in modified Skinner boxes to approach a dipper to get water at the sound of a click. Animals then learned to press a bar, which produced the click, and approach the dipper for water. After seven such days animals were divided at random into three groups: Click, No Click and Control. The Click and No Click Groups received three sessions of extinction of the dipper approaching response with bars removed. During this phase for the Click Group, the clicking sound, which had occurred after each bar press during training, was presented at frequent, irregularly spaced intervals. The click was not presented to the No Click Group. The Control Group was handled during these three days. Following this differential treatment, bar pressing and dipper approaching responses were extinguished for all three groups on two successive days.

During the seven days of acquisition of bar pressing and dipper approaching responses, animals in the

Control Group made more dipper approaches than bar presses. This relationship did not change during extinction testing. This was explained in terms of a "goal gradient" hypothesis and/or the greater amount of training at the dipper than at the bar.

During interpolated extinction of dipper approaching, more dipper approaching responses were made by the Click Group, which had received the familiar click, than by the No Click Group. This was expected on the basis of the differential presentation of the click, part of the discriminative stimulus for dipper approaching.

Interpolated extinction of dipper approaching affected both dipper approaching and bar pressing during extinction testing. Fewer dipper approaches and fewer bar presses were made by the Click and No Click Groups than were made by the Control Group. The effect was greater on dipper approaching than on bar pressing. The reduction in dipper approaches was expected since dipper approaching had previously been extinguished. The reduction in bar presses was explained in terms of the weakening of all members of a chain when one is extinguished and/or in terms of the possible extinction of responses closely associated with pressing the bar during interpolated extinction of dipper approaching.

During extinction testing the Click and No Click Groups did not differ from each other in terms of number of bar presses or dipper approaches. This was explained on the basis of the presence of stimuli, not present during interpolated extinction of dipper approaching, which controlled these responses during extinction testing.

35 pages. \$1.00. MicA54-1855

AN EXPERIMENTAL COMPARISON OF TWO THEORIES OF VISUAL DETECTION

(Publication No. 8422)

John Arthur Swets, Ph. D.
University of Michigan, 1954

A new theory of visual detection (visual intensity discrimination) developed by Tanner and Swets is compared experimentally with a theory developed previously by Blackwell and Kincaid.

The Blackwell-Kincaid theory, as originally presented, assumes that the criterion upon which detection depends is determined by sensory variables and is independent of more general psychological variables such as values or expectations. This assumption applies to situations involving the forced-choice method of response (in which the observer is required to indicate which of four time intervals he believes most likely to have contained the signal) as well as to situations involving the yes-no method of response. This assumption is consistent with the use of the usual correction for chance responses. The assumption of a fixed criterion and the use of the chance correction imply that the mechanism of detection is one that triggers when the criterion amount of the variable upon which detection depends, presumably "neural excitation," is exceeded, and

loses all discrimination for, and among, values of the relevant variable that fall short of this amount. The assumption of a fixed criterion and the use of the chance correction also imply the existence of two independent types of positive responses; in terms of data, an independence is implied between the proportion of correct positive responses after the correction for chance has been applied and the proportion of false-alarms, or positive responses to catch stimuli.

On the other hand, the Tanner-Swets theory assumes that the criterion, in the yes-no situation, is not fixed, but rather that it is variable in the interests of optimum behavior. Two definitions of "optimum" relative to the yes-no situation are considered in this report: the case where the observer maximizes the expected gain in terms of values placed on the four possible outcomes of his responses, and the case where the observer maximizes correct detections while satisfying a restriction on the proportion of false-alarm responses. The assumption that the observer tends toward optimum behavior implies that the observer can discriminate among quantities of the variable relevant to detection that do not exceed a strict criterion. These two assumptions, in turn, imply a dependence (an inverse relationship) between the proportion of false-alarm responses and the proportion of correct detections corrected for chance. These assumptions also imply that, in the forced-choice situation where the observer is required to indicate a second choice as well as a first choice, the proportion of correct second choices, given an incorrect first choice, will be greater than .33 - whereas the notion of a fixed criterion leads to a prediction of chance success of second choices or a proportion of .33.

Data were collected relative to the two instances mentioned above for which the theories make contrasting predictions. In both instances the predictions of the Tanner-Swets theory were substantiated. In an experiment in which the observer was instructed to maximize his expected gain, a highly significant correlation was found to exist between the proportion of false alarms and the corrected proportion of correct detections. The results of a forced-choice experiment showed a highly significant deviation from .33 of the proportion of correct second choices. A second yes-no experiment was performed in which the observer attempted to satisfy a restriction on the proportion of false-alarms. A primary purpose of this experiment was the determination of the form of the psychophysical function; the results indicate that the different predictions of the two theories in this instance could not be distinguished with a feasible amount of data, and that both theories were consistent with the form of the psychophysical function. Although the Blackwell-Kincaid theory may be extended to allow for the correlation between false-alarms and correct detections, its tenability depends upon discounting the second-choice data on the unlikely basis of inadequate experimental controls.

104 pages. \$1.30. MicA54-1856

TEMPORAL AND EFFORT FACTORS IN
THE ACQUISITION AND EXTINCTION OF
AN AVOIDANCE RESPONSE

(Publication No. 8440)

Donald P. Woodward, Ph. D.
University of Buffalo, 1954

A review of the literature indicates the prominence of the concept of motivation in learning theories. Attempts have been made to explain behavior for which no primary drive is immediately obvious, by means of the concept of secondary or learned motivation. This has been especially true of the concept of anxiety. Such theorists as Miller and Mowrer have attempted to integrate the concept of anxiety into a reinforcement theory. In general, investigations of secondary motivation, of an aversive type, have made use of the phenomenon of avoidance behavior.

Some of Mowrer's investigations are used as support for a two-factor theory of learning. Because of this, and because an avoidance situation has been used as an example of anxiety motivated behavior, it was felt that a somewhat more extensive investigation of some of the parameters of avoidance behavior might be made. In the present experiment, two factors affecting jumping behavior in an avoidance situation were examined. These two were:

- 1) the effect of different time intervals between the conditioned stimulus and shock, and,
- 2) the effect of different height of a barrier between the two sections of the shuttle box.

The subjects used in the experiment were 160 albino rats. All animals had previously been used in experiments using hunger or thirst drive conditions. None had been previously shocked.

The apparatus used was a modified Miller-Mowrer box.

On the day before the start of training, each animal was given five shock trials to instigate the jumping response. On each successive training day each animal was given twenty consecutive light-shock trials. The time interval by which the onset of light preceded the onset of shock was determined by the group in which the animal was placed. Both light and shock were turned off, as soon as the response was made. The following outline illustrates the groups used in the experiment.

	Height of fence in inches		
	0	2	5
Duration of warning			
stimulus in seconds.			
0			
2			
5			
10			

Training continued until the animal made twenty consecutive jumps to the light alone in any one day. On the day following the attainment of this criterion, each animal was exposed to the light only for twenty trials per day until he no longer responded to the light by jumping. The simultaneous light-shock groups were given only eighteen paired presentations.

The data were treated using the analysis of variance technique. Group by group comparison was made using the "t" test. These comparisons indicated, regarding acquisition, that

- 1) the two-second delay groups reached the criterion with fewest paired presentations, and,
- 2) the presence of a fence reduced the number of paired presentations necessary to reach the criterion of learning. Generally, the height of the fence was not a crucial factor in determining the number of shocks required.

Regarding extinction

- 1) simultaneous light-shock training resulted in a more prolonged period of extinction.
- 2) the two-second delay groups took longer to extinguish than the five-second or ten-second groups.
- 3) the no-fence groups generally took longer to reach the criterion of extinction; with the five-inch and two-inch fence groups, in that order attaining the criterion most rapidly.

These results are interpreted as support for a reinforcement theory, such as outlined by Hull. An alternate explanation in terms of Hebb is included. The position of Mowrer is examined and found to be not sufficiently well formulated to account for the results.

On the basis of the data, it is suggested that more attention be devoted to the role of distinctive stimuli in avoidance behavior. The inference of anxiety is not seen to be essential for adequate explanation of the behavior observed in the present experiment.

A bibliography of 51 items is included.

96 pages. \$1.20. MicA54-1857

RELIGION

THE VIRGIN BIRTH IN MODERN CRITICISM

(Publication No. 8611)

Thomas David Boslooper, Ph. D.
Columbia University, 1954

The Virgin Birth of Jesus has been the center of much discussion since the publication of Strauss' *Das Leben Jesu* in 1835. The purpose of this dissertation is to survey the literature on the subject, to analyze the methods which have been employed, and to evaluate the findings of the interpreters. The investigation focuses on the Virgin Birth pericopae in distinction from the birth narratives as a whole.

The history of interpretation of the Virgin Birth in Modern Criticism is pursued under three main headings: I. "Interpretations of the Virgin Birth Based on A Priori Philosophical or Theological Presuppositions," II. "Interpretations of the Virgin Birth Based on Analogies in the Pre-Christian Pagan World," and III. "Interpretations of the Virgin Birth Based on Historical and Literary Developments in the Early Christian Era." Two appendices follow: I. "The Virgin Birth in the Writings of the Early Church Fathers" and II. "The Virgin Birth in the Pseudepigraphal and Apocryphal Writings." The Bibliography at the end contains titles of nearly five-hundred selected books and articles.

In Part I the philosophical background for Strauss' mythical interpretation is outlined, his own views are presented in detail, and both the radical (the Tübingen Schule and the Christ-Myth School) and the orthodox immediate and subsequent reactions (Olshausen, Neander, Ebrard, Lange, B. Weiss, Sweet, Orr, Machen, and others) are elaborated.

Part II contains quotations from primary sources out of the religions of India and Persia, Assyria and Babylonia, Egypt, Graeco-Roman culture, and the Hellenistic civilization. Over against these references the judgment of the *religions-geschichtliche Schule* that the idea of the Virgin Birth in the New Testament has its analogy somewhere outside the Christian World is thoroughly analyzed and challenged.

Part III brings together the findings of Historical, Form, and Textual Criticism. The interpreters whose positions are described include: Harnack, G. A. Barton, J. Weiss, Lobstein, Loisy, Goguel, Guignebert, Thorburn, V. Taylor, Dibelius, and Minear. The most challenging discussions in the Part are in the sections which deal with the interpretation of Philonic thought and the relationship of Christianity to the Baptist movement.

The appendices contain numerous references to and quotations from ecclesiastical literature for several centuries following the advent of Christianity. The writings of Ignatius, the Apologists, Irenaeus, Clement of Alexandria, Hippolytus, and Tertullian are discussed briefly with special

reference to the place of the Virgin Birth in the theological system of each and the relationship of the birth traditions which they used to the canonical narratives. The second appendix brings together references to the Virgin Birth from the *Sibylline Oracles*, the *Ascension of Isaiah*, the *Odes of Solomon*, and numerous Apocryphal writings. The material taken from these appendices together with the references in Part II demonstrate that the real relationship between Christian and non-Christian birth traditions is at the point of the extra-canonical rather than the canonical narratives.

469 pages. \$5.86. MicA54-1858

SOME RELIGIOUS APPROACHES TO THE PROBLEM OF ALCOHOLISM

(Publication No. 8634)

Howard John Clinebell, Jr., Ph. D.
Columbia University, 1954

This is a comparative study of five religious approaches to alcoholism. The thesis is that the acceptance of the sickness conception of alcoholism is of major importance in determining the relative effectiveness of a given approach. The Introduction (Part One) presents the findings of various sciences concerning the etiology and developmental pattern of the alcoholic sickness, to provide a basis for understanding and evaluating the religious approaches studied subsequently.

In the body of the dissertation (Part Two), the religious approaches are described, analyzed and compared in the following areas: historical development, program of prevention and therapy, working philosophy, and psychodynamics. Each approach is evaluated in terms of the adequacy of its conceptions, and its effectiveness in maintaining sobriety and effecting personality change.

The *Bowery Mission* was found to represent the "straight evangelistic" approach to alcoholism. Its strength lies in its combination of physical and spiritual aid. Its weakness includes its misunderstanding of the nature of alcoholism and of homelessness, its use of fear, emotionalism and authoritarianism in its therapy, and its failure to utilize medical and psychiatric adjuncts to therapy.

The *Salvation Army* approach was found to be a constructive modification of the "straight evangelistic" approach. An enlightened wing recognizes alcoholism as an illness and utilizes auxiliary resources such as psychiatry, social work and A. A. This approach was ranked above the first as to general adequacy and success in dealing with low-bottom alcoholics. Its weaknesses include its authoritarian structure, its emotionalism, its negative conception of man and its lack of outright acceptance of alcoholism as a sickness.

The Oxford Group Movement approach was found to be a streamlined, upper-middle class adaptation of the evangelistic technique of the first two approaches. The method of all three is that of using group pressures, guilt and thrill to induce an emotional crisis aimed at reorienting the personality. The strength of this approach lay in its ability to reach high-bottom alcoholics and to capitalize on the power of the group. Its weakness lay in its moralistic conception of alcoholism, its negative conception of man and its dependence on thrill.

Alcoholics Anonymous was found to be a radical modification of the Oxford Group theory and technique designed especially for alcoholics. A. A. is the most effective religious approach to the problem extant. Its strength lies in its acceptance of the sickness conception of alcoholism, its non-emotional techniques for inducing sobriety, its orderly program for personality change, its emphasis on mutual self-help, and its ability to provide an accepting, permissive group experience. Its weakness lies in its tendency toward repression of inner conflicts.

The Emmanuel Movement, in contrast to the first four, was found to be outside the evangelical tradition. Psychological understanding and techniques were central rather than peripheral (or excluded). In contrast to the others, this approach had a positive conception of man, recognized the symptomatic nature of selfishness and saw the importance of unconscious forces. Its conception of alcoholism was essentially sound. Its weaknesses were the actual authoritarianism of its central technique, suggestion, and the lack of an all-alcoholic support group.

Part Three summarizes the findings of the earlier parts and draws some conclusions regarding what constitutes an effective religious approach to alcoholism. It discusses the problem of responsibility as it relates to alcoholism and the question of what is unique about a religious approach. Illustrative case material from the writer's interviews with a group of seventy-nine alcoholics are included in the appendices.

562 pages. \$7.03. MicA54-1859

SOCIAL PSYCHOLOGY

SOME EFFECTS OF GROUP MEMBERSHIP ON ATTITUDES AND THE PERCEPTION OF OTHERS' ATTITUDES

(Publication No. 8385)

Mary Alice Monk, Ph. D.
University of Michigan, 1954

The purpose of this study was to test some predictions derived essentially from the following theoretical statement: when two or more individuals in a group communicate about some issue, their communication modifies or intensifies both their attitudes toward each other and their attitudes about the issue. Communication and actual or perceived agreement with members of an attractive group are assumed to be rewarding. Some degree of concern about the issue is assumed to be necessary before the predicted relationships hold. It is hypothesized that: 1) more communication and contact with members of an attractive group are related to greater similarity of attitude and beliefs within that group; 2) accuracy of perception of a group's attitude is positively related to frequency of communication and contact with that group; and 3) perception of the attitude of an attractive group tends to be distorted toward a perception of similarity with one's own attitude - this distortion intensified by concern.

The specific predictions were tested through the facilities of the Detroit Area Study in an interview-survey of a representative sample of Detroit mothers early in 1953. The groups assumed to be attractive were: 1) social classes to which respondents said they belonged (affiliative class); 2) groups of

three best friends; 3) husband-wife pairs. The respondents and their best friends were also placed in objective classes, based chiefly on occupation. The attitudes studied were the respondents' preferences in the 1952 presidential election and the respondents' reports of their friends' and husbands' preferences. Amount of communication, contact and concern were measured by the respondent's report of her behavior and feeling before the election. Perception of a group's attitude was measured by asking the respondent how she thought certain occupational groups had voted in the election.

One of the major findings is that membership in a group is related to perception of greater similarity between the attitudes of other group members and own attitude. There is some evidence that actual similarity increases with increased attraction. Frequency of communication and concern about the election are positively related. Frequent communication is related to increased reporting of friends' attitudes and to increased willingness to estimate the attitudes of other groups. Indirect evidence supports the prediction that frequent communication, concern and accuracy of perception are related. Concern is positively related to communication, willingness to estimate others' attitudes and perception of increased similarity with other groups' attitudes - particularly those of attractive groups. The results show that membership in objective class is probably more important in relation to political attitude and to communication and concern about the election than is affiliative class.

With respect to the predictions not confirmed the following factors may have affected the expected

relationships. It is probable that affiliative class is a measure of weak attraction and does not have a meaning common to all respondents. It is also felt that women may not consider political issues relevant to social groups and may not be too concerned about politics in general. In addition, frequency of communication and contact may be less important than the content of communication in terms of affecting attitudes.

In conclusion, the theory is supported in part by the results of the study. Because of the complex structure of political attitudes and the difficulty in measuring the variables involved in this theory it is felt that the use of the survey-interview method in testing these predictions may have been premature. While it is desirable ultimately to use a large representative population in studying the theory, more intensive laboratory research may be appropriate at the present time.

221 pages. \$2.76. MicA54-1860

THE AVOIDANCE RESPONSE TO PICTORIAL REPRESENTATION OF THREATENING SITUATIONS

(Publication No. 8405)

William Abbott Scott, Ph.D.
University of Michigan, 1954

Committee Chairman: J. W. Atkinson

The problem of this investigation was to explain a paradoxical finding in studies of perceptual and imaginative behavior. Some persons give perceptual or imaginative responses related to a potentially threatening event when the stimulus conditions for eliciting these responses are weak, but avoid giving such responses when the stimulus conditions are strong (i.e., more suggestive of the threatening event).

In the present research, subjects were asked to tell imaginative stories about series of ambiguous pictures under two different conditions. The first condition (neutral), provided no intentional suggestion as to what the content of the stories should be. The second condition (aroused), for the same subjects, focused their attention on a particular event, which might be threatening to some of them. The hypothesis-information theory of cognition implies that all subjects should tell more stories dealing with the critical event under aroused than under neutral conditions. However, some of them behaved in the opposite fashion: the tendency to tell stories about the critical event decreased in the aroused condition. These subjects are called avoiders.

The proposed theoretical formulation posits a conflict between two opposing tendencies in a subject who is afraid of the event. The approach tendency suggested by the hypothesis-information theory is counteracted by an avoidance tendency; and the stronger the stimulus conditions become, the more likely the subject is to avoid imaginative references to the threatening event. Since avoidance results

from fear, it is hypothesized that symptoms of fear will appear in those stories which avoiders do tell about the critical event. According to current psychological theory and clinical testing practice, fear may be manifested within an imaginative story by: (1) blocking of imaginative processes, (2) failure to describe adaptive behavior of the characters, and (3) failure to arrive at a successful outcome.

Stories from three studies involving 139, 35, and 62 subjects were analyzed according to the proposed theoretical formulation. The threatening events represented were war catastrophe and competitive achievement situations. Behavioral criteria of avoidance and of fear expressed in stories were designated for each study. Twenty-three empirical hypotheses concerning differences between avoiders' and non-avoiders' stories about the critical event were tested. In eleven instances, stories told by avoiders contained significantly more symptoms of fear than the stories of non-avoiders. Eleven of the remaining (non-significant) differences occurred in the predicted direction. There was one significant reversal. The symptoms of fear which characterized the stories of avoiders most reliably were: (1) lack of successful outcome, (2) absence of problem-oriented activity, (3) failure of the subject to evidence a realistic acceptance of the situation, and (4) relatively short length.

Although the stories which avoiders and non-avoiders told about the critical events differed in the characteristics mentioned, their stories about non-threatening events did not. Consequently, it cannot be maintained that the designated symptoms of fear within the stories represent a fearful subject's mode of reacting to all kinds of problem situations. Rather they appear to represent a mode of reacting to those situations of which he is afraid.

The results of this research have relevance for current theories of perception and cognition. Hypothesis-information theory purports to explain all cognitive responses in terms of the relative strengths of various approach tendencies. It would appear necessary to modify the theory by positing a fear-produced avoidance tendency as one of the determinants of cognitive responses when the event is potentially threatening.

140 pages. \$1.75. MicA54-1861

GROUP COHESIVENESS AS A FACTOR IN INDUSTRIAL MORALE AND PRODUCTIVITY

(Publication No. 8406)

Stanley Emanuel Seashore, Ph. D.
University of Michigan, 1954

Committee Chairman: Daniel Katz

This study is concerned with the formation of cohesiveness in "natural" groups, and the relation of cohesiveness to member adjustment and to the formation of effective group standards. Group cohesiveness is conceptualized as attraction of members to the group. Hypotheses derived principally from

prior work with temporary laboratory groups of small size are here extended and tested in an industrial situation with established groups of varied size.

The study design uses the correlational technique, with group cohesiveness treated as the independent variable and measures of anxiety, productivity standards, member similarity, member prestige, and opportunity for interaction as the dependent variables. The data are drawn from a population of 228 groups (formally-designated work sections in a machinery factory) ranging in size from 5 to over 50 members. The data are taken from questionnaires completed by all members of these groups, 5,871 in number.

An hypothesis that members of high cohesive groups will exhibit less anxiety than members of low cohesive groups with respect to matters relevant to the group setting is supported in the case of two measures of anxiety: (a) feeling "nervous or 'jumpy'" and (b) feeling of being under pressure for higher productivity. The hypothesis is not clearly supported in the case of a third measure of anxiety, namely report of frequent worry about work-related matters, although there is a trend in the predicted direction.

The hypothesis that degree of group cohesiveness determines the power of the group to create forces toward uniformity among members is supported, using variance in actual productivity as the criterion. High cohesiveness is associated with uniformity in productivity, i.e. with the emergence of a group standard regarding productivity.

It is hypothesized that in the case of a group subjected to forces toward an uncertain or unobtainable goal imposed by an external agent, the point of

equilibrium of forces toward and away from the goal will be a function of the security of the group in relation to the external agent. This is confirmed by findings of significant between-group variance in productivity, (i.e. differences in group standard) and by significant differences in direction of deviation as between more-secure and less-secure groups. High productivity is associated with high group cohesiveness in conjunction with security in relation to the company.

The two foregoing hypotheses regarding group standards are also tested using perceived reasonable level of productivity, rather than actual productivity, as the basis for measurement of group standards. The hypotheses are not significantly confirmed, although trends in the predicted directions are obtained.

Hypotheses concerning the conditions facilitating group cohesiveness hold that high cohesiveness will be associated with: (a) the personal attractiveness of members of the group, and (b) opportunities for interaction among members. These hypotheses are supported, using a measure of job prestige as an indication of member attractiveness, and using size of group and duration of shared membership as measures of opportunity for interaction. High group cohesiveness is associated with high job prestige of members, with long shared membership in the group, and with small size of group.

It is concluded that differential group cohesiveness is an important factor in group functioning and in member behavior in a "natural" setting with group size and membership determined by factors external to and prior to group formation.

178 pages. \$2.23. MicA54-1862

SOCIOLOGY

SOCIOLOGY, GENERAL

SAMPLING MASS MEDIA CONTENT: A COMPARISON OF ONE-STAGE AND TWO-STAGE METHODS

(Publication No. 8776)

Carl Ward Backman, Ph. D.
Indiana University, 1954

The main emphasis in this investigation is on the relative efficiency of the cluster design compared to the simple random design for the sampling of communication content, particularly that of such mass media as the newspaper and the magazine. The relative merits of the other major probability designs, the systematic and stratified designs, as well as judgment sampling, are also considered, although no empirical tests of their relative efficiencies were made.

Although the cluster design has certain cost advantages stemming from its ease of application -

both prelisting and measurement costs are typically reduced - these might be more than outweighed if, as suspected, the variance of this design should markedly exceed that of the simple random design. It was hypothesized that this would occur in the sampling of content where the clusters employed consisted of issues from the same publication and where the biases of publishers, editors, and subscribers resulted in a positive correlation between the measurements within each cluster.

To test this hypothesis five sampling studies were carried out in which the simple random design and the cluster design, employed in this manner were applied to the same universe. The characteristics estimated and the universes were as follows:

Study I. The mean number of column inches per front page devoted to the Korean War in a population composed of ten newspapers of twenty issues each.

Study II. The proportion of editorial units devoted to the Korean War in a population composed of nine newspapers of twenty issues each.

Study III. The mean number of times the adjectives

United States or American were applied to the fighting forces in Korea mentioned on the front pages of a population composed of ten newspapers of twenty issues each.

Study IV. The mean number of anti-Nixon themes per editorial unit in a population composed of nine newspapers of twenty issues each.

Study V. The proportion of employed heroines in a population of romantic short stories composed of twenty stories from each of seven magazines.

In Studies II and V the size of the intraclass correlation coefficients, ρ , was small, .03 and .04 respectively, and the resultant differences between the variances were not significant. In studies I, III, and IV the ρ 's were .33, .19, and .10 respectively, and the differences were significant at the one percent level of confidence. In the latter three instances the variance of the cluster design was respectively eight, five, and three times that of the simple random design: hence the relative efficiency of the former design was seriously impaired.

The above results, along with an examination of the relative merits of the other major designs in the light of the typical research situations encountered in the sampling of content, suggest that at our present stage of knowledge in this area the simple random design is typically to be preferred to these more complex designs. This is supported by two considerations. First, the various obstacles met in the employment of this design are more easily surmounted in the sampling of content than elsewhere. For instance, prelisting of universes of content is relatively easy. Second, these other designs require information about the universe which is generally lacking for universes of content. Where this is the case their use may be hazardous, if not impossible.

118 pages. \$1.48. MicA54-1863

FUNERALS AND FUNERAL DIRECTORS IN THE UNITED STATES: A SOCIOLOGICAL ANALYSIS

(Publication No. 8613)

LeRoy Edward Bowman, Ph. D.
Columbia University, 1954

Mourning rites and funeral ceremonies have long been of theoretical interest in anthropology, psychology and sociology, if only because they represent instructive cases of the social patterning and organization of emotion. For the most part, however, little attention has been devoted to these ritual activities in complex societies, such as the United States, where they have largely come under the management of such specialists as the funeral director. Apparently, the subject is generally considered appropriate only for macabre humor unless the locale is far from home and preferably in a primitive society.

Judging from direct observation, interviews and the analysis of documentary materials, there is a widespread pattern of stages in the funeral. In broad outline, there are: (1) the initiation of a series of cultural observances at the home of the deceased; (2) visiting of acquaintances at home or funeral

parlor (the wake); (3) the ritual service; (4) the committal service; and (5) the return of the family to the home. Each of these stages has its characteristic pattern of social interaction and the groups represented at these occasions have their distinctive places in the local social structure.

Five funerals, each taken to be roughly typical for a particular group, are described in considerable detail. The major social consequences of these proceedings are found to be the re-experiencing of group life, the reaffirmation of the intergroup affiliations of the deceased and the reappraisal of selected social norms on the part of some of those attending the funeral. Some effort is made to identify the social mechanisms at work in this situation to bring these consequences about. The extent to which these social consequences do in fact occur seems to depend, in part, on the preeminence of the deceased, the character of the group(s) under whose auspices the ceremony occurs and the degree to which the values of this group are in accord with those of the larger society.

Following upon this study of the funeral ceremony itself, there is a study of the occupation charged with organizing and directing the ceremony: the undertaker. The relations between undertakers and their clients are examined in terms of the contexts in which these relations occur: the pressure of time and the effect of this on the character of the decisions which are reached, the specialized knowledge of funeral procedures which is now largely a matter of occupational competence and the bases for the determination of the prices of funerals.

On a national scale, undertaking is analyzed in terms of the size of the business, the various types of firms and establishments. Prevailing modes of funerals are found to reflect certain changes in social relations. An apparent overabundance of undertaking establishments has led the several national associations of funeral directors to advocate professional status for their membership and a sharply rising cost of funerals.

Prospective undertakers generally aspire to economic security rather than great riches. Training for the vocation involves a year or less of study and an apprenticeship of the same length of time. Many features of the personal and family relationships of morticians are colored by the aversion of acquaintances to dead human bodies and the persons and places involved in their handling. The relation of the undertaker to physicians and governmental officials is cordial and cooperative, to social workers and the clergy is competitive or antagonistic. In numerous respects, the funeral business is closely identified with other parts of the business system.

347 pages. \$4.34. MicA54-1864

PROPAGANDA EFFECTIVENESS AS A FUNCTION OF HUMAN VALUES

(Publication No. 8341)

William Robert Catton, Jr., Ph.D.
University of Washington, 1954

During 1951-53 the Washington Public Opinion Laboratory, under contract to the United States Air Force, executed a large-scale research program in problems of leaflet warfare. "Project Revere," as this program was designated, included this and several other theses.

This thesis is concerned with the relationship between certain characteristics of leaflet content and the effectiveness of leaflets as a propaganda medium. Proceeding from what is known about selective attention in mass communications, it is assumed as a working hypothesis that propaganda effectiveness depends on (a) the pre-existing interests of the target population, (b) the nature of the behavior the propagandist wishes to evoke, and the probable consequences thereof to the target population, and (c) the quality of the leaflet content. A theory of human valuing is presented which suggests that effective leaflet content consists of "word-maps" which make the desirable consequences of the intended behavior seem psychologically "near" to the reader - near him in "value-space."

The central problem of this thesis is to ascertain the dimensionality of this postulated value-space. By the use of a model, and following a discussion of the role of models in sociological research, a list of testable and interrelated hypotheses is formulated. Several of these refer to the problem of dimensionality, and the remainder have to do with an attempt to predict the mail-back response to a set of seventeen different leaflet versions dropped from the air on a Washington community.

Psychometric techniques are applied to propaganda leaflets as stimuli, to obtain data for testing the various hypotheses. On the basis of such leaflet-rating data it is tentatively concluded that value-space has at least seventeen dimensions. The attempt to predict mail-back responses was unsuccessful; insufficient variability in the leaflet versions and ending of the Korean war are adduced as possible explanations for this failure.

In a concluding discussion the author describes propaganda as a socially necessary form of behavior, one which will continue to be prevalent whether we like it or not. It is suggested that a more felicitous adjustment to this situation depends on certain attitude changes - changes which might result from consideration of the value-space and value-field concepts.

216 pages. \$2.70. MicA54-1865

THE TRADITION OF OPPORTUNITY AND THE ASPIRATIONS OF AUTOMOBILE WORKERS

(Publication No. 8630)

Ely Chinoy, Ph.D.
Columbia University, 1953

This study reports an investigation of the aspirations of a group of automobile workers in a middle-sized midwestern city. Industrial workers face in their occupational lives a palpable disparity between the American tradition of individual opportunity and the realities of their own experience. On the one hand they are encouraged to pursue ambitious goals by the assurance that anyone with ability and determination can "succeed." On the other hand they have only limited opportunities for advancement.

Automobile workers were studied because they are employed in an industry whose growth dramatized the tradition of opportunity but whose present character makes advancement difficult for workers. Most of the data were secured in intensive interviews with sixty-two workers in one large plant. These data were supplemented by reports from informants, informal social participation with workers, and several weeks of work in the plant.

These workers were clearly aware of the limited opportunities available to them in the factory. None suggested the possibility of reaching the top-salaried ranks. Even foremanship, the obvious next-step, held little promise, and only a few workers had hope for such advancement or were desirous of becoming foremen. In part this lack of interest is probably rationalization. But in many cases it seemed genuine, stemming from evaluations of the foreman's role, from a critical view of how management selected foremen, and from unwillingness to assume responsibility.

Opportunities on the level of wage labor were also limited. Skilled jobs were comparatively few in number and increasingly demanded educational prerequisites which many workers lacked and required formal training which workers could not afford to undertake. Compressed wage scales left little room for individual wage increases. Workers' objectives in the plant were therefore confined primarily to easier tasks and steady employment, with jobs arrayed in a rough order of preference based on these criteria.

The possibility of leaving the factory, usually to start some kind of small business, was the focus of much interest and a staple topic of conversation among workers. This interest, however, was primarily a negative response to factory jobs; lack of opportunity and lack of satisfaction in the plant accounted for the widespread interest in leaving. But most of the men were "just talking." They had made no plans and had no concrete job goals, for in most cases they lacked the necessary knowledge and financial resources and, if they had high seniority, they were reluctant to exchange it for the uncertainties of business with its high rate of failure. Talk of leaving, however, served to make present difficulties more tolerable, as a means of impressing

others with one's ambition, and as a mark of identification with traditional American values.

A few workers had secured some of the conventional rewards of success from union office. Despite these rewards, those who pursued union careers could not feel that they were "successful" because of the prevalent ideology surrounding union leadership.

Although all the data were collected during a short period of time, there did appear to be a more or less typical "chronology of aspirations" which these workers followed during their occupational careers, but only an intensive longitudinal study could adequately test this hypothesis.

Some workers respond to their failure to "get ahead" and their limited goals with guilt and self-blame. But most workers continually try to rationalize their status and to justify their small ambitions. They redefine advancement to include their small goals, they retain the verbal illusion of out-of-the-shop goals, they foster ambitious hopes for their children, and to some extent they minimize success and emphasize alternative values.

245 pages. \$3.06. MicA54-1866

AN INSTITUTIONAL APPROACH TO A THEORY OF CRIME

(Publication No. 8789)

Clarence Ray Jeffery, Ph.D.
Indiana University, 1954

The fundamental problem dealt with is criminological theory, its method and its assumptions. Is crime anti-social behavior or is it anti-legal behavior? Nineteenth century positivism defined crime as anti-social behavior, behavior bad in itself. The positivist attempts to answer the question "who is the criminal?" without first knowing "what is crime?" Criminal behavior and crime have been confused. Law, mores, customs, and habits have never been distinguished, whereas they must be and can be in terms of the social unit basic to each. Violations of the Roman Catholic Mass are not labeled crime, yet they are anti-social behavior from the point of view of the Church. Crime refers only to those violations involving the state as the basic social unit.

In England crime emerged as an aspect of nationalism and Christianity. The tribal units which made up early Saxon society had conduct codes which were enforced by a kinship group. The family was the injured party, the social unit responsible for the blood-feud. As the tribal basis of society disintegrated and was replaced by feudalism, the blood-feud was gradually replaced by a system of compensations. These payments were made to the family, to lords and bishops, and to kings. Justice was taken out of the hands of the kinship group and placed in the hands of lords and bishops.

Christianity furnished this society with a code of morality, its political philosophy, and its doctrine of natural law. The doctrine of natural law furnished the positivist with a doctrine of crime *mala in se*.

The Norman invasion completed the feudal epoch in England, subjecting a rural Saxon peasant to a Norman military class. The legal system remained a system of compensations. Justice was administered in manorial courts by the landlords.

The law of England remained a system of private law until the reign of Henry II. There now appeared offenses designated as crimes by the Crown, offenses against the state as a territorial unit, and involving a mental element of *mens rea*. Justice now was in the hands of the Crown, through a system of writs, itinerant justices, and royal courts.

The implications of an institutional approach for current criminological research are varied. Primitive social systems have conduct codes which are administered by a kinship group. They do not possess the notion of offenses against a territorially demarcated unit. Crime in China appeared upon contact of China with the West. Chinese law was family law, and crime was an aspect of social changes which culminated in nationalism.

Current topics in criminology: white-collar crime, professional crime, syndicate crime, and military crime, are analyzed in terms of the state as the social unit basic to crime.

The writer concludes that the positivist's definition of crime as anti-social behavior is not empirically verifiable. Behavior is never bad in itself; it must be designated as such by the social structure. The American sociologist, because of his positivistic orientation, has never differentiated crime and criminal behavior, and as a result the field lacks a definition of crime, an explanation of criminal behavior, a subject matter, and a theory of crime.

282 pages. \$3.53. MicA54-1867

ADJUSTMENT OF MIGRANTS IN THE URBAN AREA: A STUDY OF PARTICIPATION IN THE URBAN COMMUNITY IN RELATION TO MIGRATION EXPERIENCE

(Publication No. 8437)

Basil George Zimmer, Ph.D.
University of Michigan, 1954

Since it is known that all people in a community do not participate in the activities of the community to the same extent, our problem is to determine whether part of this difference can be attributed to the fact that segments of the population have migrated to the community and have been trained to live in dissimilar community structures.

Specifically this study attempts: (1) to study behavior in relation to migrant status and migrant type with particular attention being focused on the influence of farm background, (2) to measure the length of time required for migrants to reach the level of participation of the natives, and to determine how previous community background influences the "rate of entering" selected activities of the community, and (3) to describe the relative differences of various methods of defining migrants and to evaluate the fruitfulness of each method with

particular reference to the concept as used by the Census Bureau.

Interviews were obtained from a representative sample of family units in a predominantly industrial community located in the midwest - Ypsilanti, Michigan. The following indices of participation are used: Membership in Formal Organizations, Frequency of Church Attendance, Membership in Church Organizations, Membership in Unions, Officership in Organizations, Registration to Vote and Occupation. Indices of migrant status and migrant type are: Length of time lived in the community, community types on a rural-urban continuum, and a regional classification. Migrant types are based on place of birth and last place of residence. Farm background is further analyzed according to amount of farm experience. Age, education and occupation are employed as control variables throughout our analysis.

It was found that migrants have a significantly lower level of participation in the activities of the community than do the natives. Level of participation varies by type of previous community experience along a rural-urban continuum. Length of time in the present community is directly correlated with level of participation in the community. Thus, it appears that familiarity with the community facilitates integration in particular structures. Although migrants tend eventually to become similar to the non-migrants in level of participation, the length of time required varies for different migrant types. Farm migrants have the slowest entrance rate. Level of participation of farm migrants decreases consistently with length of time lived on a farm.

It was found further that certain kinds of personal characteristics tend to enable migrants to transcend the limitation of previous environments or short residence in the community.

The various methods of defining migrants do not have equal merit. The most fruitful approach is to differentiate all migrants according to length of time lived in the present community. The "census type" approach has many significant shortcomings.

For this community we have found that the negative influences of migration are decreased to the extent that migrants are familiar, through previous experience, with the way of life in the community of destination. Migrants coming from similar environments "adjust" more rapidly and are more similar to the natives in behavior than are migrants coming from dissimilar environments.

Our data lend support to the position discussed in the literature that some aspects of the present integration in our urban communities may be transitional in character. Our findings clearly support the hypothesis that part of the differences in behavior observed in the urban community can be explained in terms of the divergent previous experience of persons making up the urban population. Therefore, since urban centers have large aggregates of farm migrants, this is an important factor that must be assessed in our attempt to understand behavior in the city.

330 pages. \$4.13. MicA54-1868

SOCIOLOGY, FAMILY

MARITAL ADJUSTMENT IN THE UNIVERSITY OF WASHINGTON MARRIED STUDENT COMMUNITY

(Publication No. 8361)

Glen Theodore Nygreen, Ph. D.
University of Washington, 1954

This thesis reports the patterns of adjustment of married students to life in the college community, and relates these patterns to the level of marital adjustment.

The sample was drawn randomly with replacement from the population of married students attending the University of Washington during Winter Quarter, 1950, with certain exclusions. The interviewing conditions were standardized to prevent collaboration between spouses. Responses are reported for both partners of 461 couples, or 92.2 per cent of the initial sample of 500. This is the first time that random sampling procedures have been utilized in a study of marital interaction.

The measure of marital adjustment used is a thirteen-item scale for general evaluation of the marriage. Scales for nine areas of adjustment in marriage are also employed. These are:

1. how money should be spent
2. matters of recreation
3. relationships with in-laws
4. matters having to do with friends
5. religious beliefs and practices
6. sexual adjustments in marriage
7. homemaking duties and responsibilities
8. care and training of children
9. satisfaction with amount of affection.

The data establish that husbands are significantly more critical of their marital adjustment than are wives, a finding which differs from that of other studies in the field. Husbands are significantly more critical than wives around sexual adjustments in marriage. Wives were significantly more critical than husbands in adjustments around religious beliefs and practices. The correlation between marital adjustment scores of husbands and wives was .55.

The ten scales all showed Guttman coefficients of reproducibility above .80, eight of them above .85. Scale scores on all areas tended to vary directly with marital adjustment score.

Median student family income was found to approximate the median income for Seattle families as reported by the 1950 Census. Monthly income was found to exceed monthly spending significantly, counter to all expectations. The correlation between income and marital adjustment was found to be positive but low in value.

Direct financial assistance from parents was reported by 16.7 per cent from husband's parents, by 14.6 per cent from wife's parents. Only thirty couples lived with the parents of one of the partners. These did not differ significantly in level of marital adjustment from other couples.

Husbands demonstrated more conservative and

traditional attitudes toward employment of the wife than did wives. The employment of the wife is positively associated with her marital adjustment but the data are not sufficient to allow rejection of the null hypothesis of no association between wife's employment and her level of marital adjustment.

Students report little effect of school on their marital adjustment. They report that marriage positively influences what they 'get out of' school, less strongly that marriage increases their enjoyment of school. The majority say that marriage had no effect on their grade averages or upon their choice of academic major.

Housing did not prove to be a major source of dissatisfaction. Dissatisfaction with housing is significantly associated with poor marital adjustment for wives only.

Married students do not find their recreational outlets in University sponsored programs. Their friends tend to be other married students and, just as frequently, non-students.

Parents have significantly poorer marital adjustment scores than non-parents. The majority of student families, 52 per cent, had children, and reported that they did not wish they had waited until later to have them. As the number of children in the family increased, fathers were less likely to recommend combining marriage and school for others similarly circumstanced.

A more complete summary is found in Chapter XI. The strengths and weaknesses of the study are discussed in the final chapter.

346 pages. \$4.33. MicA54-1869

SOCIOLOGY, PUBLIC WELFARE

A STUDY OF SOME PHASES OF CHINESE-AMERICAN CO-OPERATION IN PROMOTING CHINA'S AGRICULTURAL EXTENSION

(Publication No. 8600)

Marguerite Atterbury, Ph. D.
Columbia University, 1954

Present Technical Assistance Programs evidence a realization of human values, and a groping for symbiosis, or a mutually advantageous way of living. But the vastness of the world's need impels study of past experience in serving disadvantaged populations. Two historical examples of such Technical Assistance are the United States Co-operative Agricultural and Home Economics Extension Service, and America's co-operation with China in Agricultural Extension.

The purpose of this research is:

First, to review in part the record of Chinese-American co-operation as an inspiring and little-known chapter of history.

Second, to see if Chinese-American co-operation has made an effective contribution to the improvement of China's rural life, and to the development of a National Agricultural Extension System.

Third, to see if Chinese-American co-operation has promoted multinational co-operation, especially in United Nations' Agencies, and to deduce principles for Technical Assistance Programs.

The data drawn from early examples of Chinese-American co-operation in Agricultural Extension, from case studies, and from the record of training China's agricultural personnel in America indicate that this co-operation has made an effective contribution to China's rural life, and to a National System of Agricultural Extension.

The number of people recruited from bi-lateral co-operation for multi-national co-operation indicate that Chinese-American co-operation has promoted wider co-operation, on an international plane. The record of Technical Assistance in China supplies principles for Technical Assistance in other parts of the world.

In conclusion, it is seen that in certain cases at least, synergism promotes symbiosis - or effective co-operation in work induces mutually advantageous living.

413 pages. \$5.16. MicA54-1870

SPEECH - THEATER

AN ANALYSIS AND EVALUATION OF PHONEMIC DIFFERENCES IN THE SPEECH OF BOYS AND GIRLS AT THE KINDERGARTEN, FIRST, SECOND AND THIRD GRADE LEVELS

(Publication No. 8379)

Sister Helen Daniel Malone, S. S. J., Ph. D.
University of Michigan, 1954

The purpose of this experiment was to investigate the relative frequency of occurrence of phonemes in the speech of boys and girls at the primary grade levels, and to apply the phonemic frequency index as a gauge of language development. Two basic hypotheses were tested: 1) There is no significant difference between the relative frequency of occurrence of phonemes in the free conversation of successive age groups of children divided as to sex; 2) There is no significant difference between the relative frequency of occurrence of phonemes in the free conversation of boys and girls of the same age level. The results were compared also with findings of other investigators who studied infant and adult levels.

Scores of phonemic frequency were obtained from tape recordings of spontaneous speech. Records of the free conversation of two hundred children were transcribed phonemically and a running sample of 500 phonemes was taken from each subject's conversation.

Comparison of percentage of phoneme occurrence between boys at successive levels, and between girls at successive levels, was made by examining mean percentage scores. The differences are not statistically significant, but indicate the trend of development. An examination of the two most distant levels, namely, kindergarten and third grade, offers evidence of a progression from an abundance of easy sounds to an ever-increasing representation of more difficult ones. However, when the results at each of the four levels are analyzed successively, they reveal departures from an even course, and specific regressions at the first and second grade levels.

Comparison of percentage of phoneme occurrence between the sexes at each of the four chronological age levels was made by examining the mean percentages for boys and for girls. The data suggest a slight superiority on the part of the girls in the direction of differences revealed, and a phonemic frequency score which more closely approximates that of the adult. Certain qualitative differences in speech and language merit further investigation.

Results of the alignment of these findings with those of Irwin on phonemic frequency at the infant level, and of Voelker at the adult level, indicate that third grade girls have a slight, but consistent, numerical ascendancy over third grade boys and more

closely approximate the adult scores; that third grade as a unit shows a decided increment in relation to findings at the infant level, but falls short of adult level scores. The application of a summary of differences ratio reveals that the third graders have progressed only two-thirds of the way to adult status in phonemic frequency, as determined by Voelker.

Results are consistent with the concept that maturation of the individual is a decisive factor in his phonemic frequency score, and in general, concede a slight ascendancy of girls over boys in this language area.

Since the experiment has also demonstrated that these primary grade levels must still be regarded as transitional in the development of phonemic frequency, further investigation at the next age levels is indicated.

279 pages. \$3.45. MicA54-1871

AN EXPERIMENTAL STUDY OF FOUR METHODS OF TEACHING BEGINNING SPEECH IN COLLEGE

(Publication No. 8475)

Roy Conrad Nelson, Ph. D.
University of Minnesota, 1954

Adviser: Howard Gilkinson

The purpose of this study was to compare the effects of four methods of teaching public speaking in the basic college course and to determine by the analysis of variance and the analysis of covariance whether or not there was a difference in learning among the four methods. The effects measured were:

1. Changes in speaker confidence, determined by Personal Report of Confidence as a Speaker.
2. Changes in critical thinking, tested by the Watson-Glaser Critical Thinking Appraisal; and
3. Changes in effectiveness of communication, measured by the ratings of a committee of three judges.

In the first method, the course was organized around a series of speeches of graduated difficulty, beginning with a simple introduction and progressing to a persuasive speech. In the second method the student presented a series of argumentative speeches, all of equal difficulty. The experiences in the third method were based on a variety of speaking forms, i.e., one extempore speech, a discussion, a debate, a memorized selection, etc. In the fourth and final method, there was the same progressive organization as in the first method, but it required that for all students the topics be restricted to some phase of United States Foreign Relations.

In addition to testing the hypothesis of no difference in these methods, this study also sought to determine whether or not there was an intercorrelation of the three criteria of gains in critical thinking, speaker confidence, and effectiveness of communication.

The experiment was conducted at Colorado A & M College during the first two quarters of the academic year 1952-1953. Two instructors taught each of the four methods in four different sections of beginning speech in the fall quarter and also in the winter quarter. The methods were randomly assigned to the sections. Measurement in each of the criteria was based on the gains made by 160 male students, 10 being drawn from each of the 16 sections in the experiment.

Major findings were as follows: The gains made during the 10 weeks' period of training for each of the four methods was statistically significant for all three of the criteria. An analysis of variance of critical thinking gains resulted in a significant F ratio for methods, instructors, and quarters. However, when the gains were submitted to an analysis of covariance, it was found that the difference in methods could be accounted for by regression of gains on initial scores. Significant ratios still held for quarters and instructors even after regression was taken into account. In addition, the interaction of instructors by methods in the covariance test was found to be significant.

When the gains made in effectiveness of communication were submitted to an analysis of variance, all of the main effects and interactions, with the exception of quarters, yielded F ratios which were not significant. The analysis of covariance test determined that the significant F in quarters found in the analysis of variance could be accounted for by regression. In an analysis of variance of gains in speaker confidence ratios for both main effects and interactions in every case were not statistically significant.

When gains in speaker confidence and effectiveness of communication were correlated, an r of .18 was obtained. The correlation coefficient for gains in speaker confidence and gains in critical thinking was not significant. Neither was the correlation coefficient for gains in critical thinking and effectiveness of communication significant.

172 pages. \$2.15. MicA54-1872

THE HISTORY OF THE THEATRE IN TOLEDO, OHIO, FROM ITS BEGINNINGS UNTIL 1893

(Publication No. 8418)

Norma Frizzelle Stolzenbach, Ph. D.
University of Michigan, 1954

The history of the nineteenth-century theatre in Toledo, Ohio, covers a sixty-year period beginning with the founding of the city in 1833, and ending with

the decline of the melodrama and the burning of the theatre which housed it in 1893. This study is divided into four sections; each section is devoted to the particular playhouse which was the major theatre of the period.

The first section is devoted to the improvised theatre and the entertainment halls built by Thomas Dunlap. The earliest drama in Toledo was presented in makeshift surroundings. In 1850 Thomas Dunlap built Union Hall, the first commercial entertainment hall, which served Toledo as a theatre until 1856. In 1856 Mr. Dunlap opened Stickney Hall, which housed dramatic entertainment until 1861.

In 1861 A. N. White of New York built White's Hall. This playhouse was adequate to house the small casts of the standard romantic drama, but when the spectacular melodrama rose to popularity, White's Hall was too small.

In 1871 the Wheeler Operahouse was opened. It was a typical nineteenth-century theatre with a large stage and ample room backstage. Wheeler Operahouse served for twenty-two years as Toledo's major theatre, and was visited by nearly every star who toured. The last five years of its existence it fell into disrepute. Toledo citizens began plans to build a "modern" theatre; but before it could be built, the Wheeler Operahouse burned to the ground.

The last section of this study is devoted to the minor theatres which presented entertainment at popular prices. In 1885 the Whitney management, operators of Wheeler Operahouse and all major theatres in the Midwest, renovated White's Hall and changed the name to People's Theatre. In 1889 this theatre closed, and a second People's Theatre was opened. These theatres housed touring companies from the minor New York theatres.

Various types of acting companies played Toledo during the nineteenth century. The Dunlap Halls housed actors from the Midwest managed by mid-westerners who leased the hall for a few weeks. White's Hall first housed resident companies whose managers leased it for the season. It also housed visiting stars who appeared with the resident company. Wheeler Operahouse was played by stars, who traveled with their own companies, and by the well-balanced company which featured leading men and women instead of stars.

The drama played in the nineteenth century included plays by Shakespeare and the standard romantic dramas. The contemporary drama, including the well-made play, the melodrama, and the character comedy, became popular in the 1870's.

Since all nineteenth-century actors traveled, histories of inland theatrical centers are needed to complete the total picture of dramatic activity in America. Toledo, Ohio, a recognized lake port and railroad center, was also an important theatrical center. The theatres, the actors appearing in them, and the plays presented there are typical of those in all American "show towns."

342 pages. \$4.28. MicA54-1873

ZOOLOGY

SOME EXCRETORY PROCESSES IN THE OCTOPUS

(Publication No. 8347)

Florence Louise Montana Harrison, Ph. D.
University of Washington, 1954

The few earlier investigators of urine formation in the octopus were in agreement that a process of secretion from blood to urine took place. They disagreed on filtration as a process, no clear-cut evidence having been found. It followed that the process of reabsorption of substances from urine to blood, while claimed by one group, had no established physiological role.

Knowledge of excretory processes in the vertebrate has increased rapidly during the past two decades largely as a result of development of the concept of "clearance." A standard substance which is completely filterable at the glomerulus and is neither reabsorbed nor secreted at the tubule permits a quantitative comparison with any other substance. From the comparison and knowledge of the filterability of a compound, one may judge the activity either of secretion or reabsorption of the unknown compound.

It is generally agreed that in order to obtain valid results in the study of renal structures sensitive to anoxia and blood pressure changes, the experimental animals must be in very good physiological condition. One of the important advances made by this work is the development of adequate techniques for the collection of blood and urine samples from relatively normal, unrestrained, unanesthetized octopuses.

From the results of the experiments presented in the thesis it appears that inulin may serve as a standard substance in the octopus as in the vertebrate, filtered at an unknown site, but neither secreted nor reabsorbed. Other evidences for filtration are presented: 1. Glucose normally present in the urine in low concentration, rises to a concentration equal to that in the blood when phlorizin is administered. This agent is well known in other organisms to poison the active transport of glucose. It is believed that these observations, both normal and abnormal, constitute evidence for filtration. 2. Materials ordinarily secreted to a high final concentration into the urine do not fail to be excreted when metabolic poisons prevent active transport, but appear in the urine at the same concentration as in the blood, again evidencing a basic filtration process.

Good evidence for filtration having been obtained, the demonstration of glucose reabsorption both became of importance *per se*, and helped to confirm the existence of a filtration process.

Finally, levels of activity of some secretory processes capable of transporting materials also secreted by the vertebrate kidney were determined.

The octopus renal organs are able to excrete phenol red and p-amino hippuric acid at rates not much inferior to that in a human of comparable size. In addition to the secretion of these two substances, urea is actively transported in the octopus renal organs. It is of interest that drugs which poison the transporting mechanisms for these materials in the vertebrate kidney also poison the similar mechanisms in the renal organs of the octopus.

114 pages. \$1.43. MicA54-1874

AN EXPERIMENTAL STUDY OF COMPETITION FOR FOOD IN FISH

(Publication No. 8356)

Craig MacPhee, Ph. D.
University of Washington, 1954

Stemming from laboratory studies of competition in yeasts, protozoans, crustaceans and insects in a one-niche environment, interest in this work centered on the outcome of competition when fish were forced to live together in a restricted territory and compete for the same limited particles of food. Preliminary investigations showed that a knowledge of intraspecific competition was basic to an understanding of interspecific competition. Consequently, this report is limited to what happens when fish of the same species are fed small particles of food in such a way that each bite permits an act of competition to occur.

Three species of fish, the coho salmon, *Oncorhynchus kisutch* (Walbaum), the large-mouth bass, *Micropterus salmonoides* (Lacépède), and the common sunfish, *Lepomis gibbosus* (Linnaeus), were tested mostly in pairs although exploratory work in groups of three and twenty was done. Two species of *Drosophila* were cultured and used as food items.

The manner in which flies were partitioned between pairs of fish and characteristics of fish which determined this partitioning were objectives in early experiments. An exacting examination of dominance-subordinance relationships in which every aggressive act and feeding response of the fish were noted by the observer was an object of later studies.

Three methods of feeding fish resulted in different feeding responses. When fish were fed flies one by one, at regular time intervals, competition was most severe. When fish were fed a group of flies at one time, competition was least severe; and when fish were fed live flies at random by confining them to an area above the water, the degree of competition was intermediate.

The size of the group, the method of feeding, and absence of previous contact before the first feeding altered the feeding behavior of fish significantly. Variations in feeding responses were directly associated with chasing by dominant fish. A scale for

measuring intensity of chasing was used and intensity of chasing and frequency of chasing were separated for the first time in fish. The relation between intensity of chasing and success in feeding was positive and curvilinear, an asymptote being reached. The relation between frequency of chasing and success in feeding is somewhat parabolic, the frequency of chasing varying not only with the frequency of stimulation by the subordinate, but also with the effort put forth by the dominant to prevent the subordinate from feeding.

Plumpness or condition in fish was calculated from length-weight relationships and in contrast to the "condition factor" which follows the "cube law," is termed the "empirical condition factor" (E.C.F.) in this thesis. For salmon and bass measurable characteristics such as the E.C.F. of the dominant, of the subordinate and of the aggregate, as well as the percentage E.C.F., were negatively correlated with frequency and intensity of chasing in various situations. Percentage weight and intensity of chasing were positively correlated in salmon. In sunfish and bass, percentage weight was positively correlated with success in feeding.

Fish which were both lighter and dominant and fish which showed reversals in dominancy were limited to pairs which were about equal in weight.

The methods developed give the possibility of quantitatively evaluating differences in food intake and aggressive behavior in fish.

212 pages. \$2.65. MicA54-1875

A STUDY OF THE CHOLESTEROL AND ASCORBIC ACID CONCENTRATIONS IN ALBINO RATS, HAMSTERS AND TURTLES

(Publication No. 8382)

Mary Brown Chin Miroff, Ph. D.
University of Michigan, 1954

The physiological changes during the estrus cycle and parturition are closely associated with alterations in the adrenal and ovarian metabolism of steroids. Comparisons of the cholesterol and ascorbic acid in the adrenals, ovaries and sera of rats and hamsters were made.

The adrenal responses of rats, nonhibernators and homotherms, to cold exposure, were measured by variations in the adrenal cholesterol and ascorbic acid. Depletions of these substances indicated increased production of cortical hormones. Hamsters are ordinarily homotherms but may become poikilotherms or hibernators. Turtles are obligate poikilotherms. The adrenal responses in these three species were determined, by comparing the adrenal and serum levels of cholesterol and ascorbic acid.

The Schoenheimer-Sperry method, based on the Liebermann-Burchardt reaction, was used to determine the total and free cholesterol. This method precipitated cholesterol as the digitonide complex. Ascorbic acid was measured colorimetrically by the Roe and Keuther method. Dehydroascorbic acid was

coupled with 2,4-dinitrophenylhydrazine and the addition of strong sulfuric acid gave a red color.

Rats sacrificed during proestrus had reduced concentrations of cholesterol and ascorbic acid in the adrenal glands, indicating increased adrenal cortical activity. During estrus, there were decreases in the ovarian cholesterol of rats. Throughout the estrus cycle, the adrenals of hamsters did not contain esterified cholesterol. However, free cholesterol was found to be present. The ovarian cholesterol of hamsters during estrus was also decreased.

The adrenal responses of physiological conditions associated with the termination of pregnancy resulted in depletions of total adrenal cholesterol and ascorbic acid in rats. No changes occurred in the concentrations of free cholesterol. Esterified cholesterol was discovered to be present in the adrenals of the parturient hamsters. Hyperplasia of the adrenal glands, observed in parturient rats, could not be detected in the parturient hamsters.

The adrenal responses of male rats exposed to the cold indicated increased adrenal cortical activity. These responses were adrenal hyperplasia, and rapid depletions of adrenal cholesterol and ascorbic acid. Under the same experimental conditions, only a moderate decrease of adrenal ascorbic acid was observed in male hamsters. The amount of free cholesterol remained unchanged. No esterified cholesterol, or adrenal hyperplasia, could be detected in the adrenals of either the controls or the cold treated hamsters. The continuous exposure of male turtles to the cold failed to produce any alterations in adrenal weights. The cholesterol of the adrenals and serum remained unchanged.

The adrenal responses of hamsters to the physiological stresses of parturition and cold exposure differed from the responses of rats. The absence of esterified cholesterol in the adrenals of normal hamsters and its appearance in parturient hamsters were partially responsible for these differences. However, the adrenals of turtles contained both free and esterified cholesterol, but, measurable adrenal responses could not be detected. The moderate adrenal ascorbic acid decreases in hamsters, and the absence of any adrenal responses in turtles, exposed to the cold, might indicate that the stress was of insufficient intensity and/or duration for these animals. However, the differences in the pituitary-adrenal patterns and in the thermal mechanisms might also be responsible for the contrasting results obtained in the adrenal responses of these three species.

68 pages. \$1.00. MicA54-1876

ANATOMY, LIFE HISTORY, AND EVOLUTION
OF THE MITES PARASITISING
FRESH WATER MUSSELS

(Publication No. 8383)

Rodger David Mitchell, Ph. D.
University of Michigan, 1954

Members of two subfamilies of Unionicolidae, Unionicolinae and Najadicolinae, are similar anatomically. A five-lobed mid-gut fills most of the body cavity. The gonads lie between the posterior lobes of the mid-gut. The remaining organs lie between the mid-gut and the body wall somewhat as follows: the excretory organ over the dorsal surface of the mid-gut, oral glands anteriorly, and nerves and muscles on the ventral body wall. Externally, most Unionicolinae are characterized by elongate setigerous swimming legs with the basal segment acted upon by very powerful elevators. Reduction in leg length and chaetotaxy are typical of the more modified parasitic forms; these modifications are most extreme in *Najadicola*. Members of the Unionicolinae were found to have the genital field of the female modified for ovipositing in sponge or unionid tissues. *Najadicola*, a parasite that does not oviposit in the host tissue, has an unmodified genital field.

In the vicinity of Ann Arbor, Michigan, *Najadicola ingens* and four species of *Unionicola* parasitize *Lampsilis siliquoidea*. Among the species of *Unionicola* some fourteen different life history stages were spent within the host; all of the stages were spatio-temporally separated. One species, *Unionicola aculeata*, was a transient parasite with only the three quiescent stages spent within the host; this mite evidently does not feed on the host. The remaining species, *U. abnormipes*, *U. fossulata*, and *U. serrata*, were all resident parasites that remained in the host through all of the life history stages excepting the larval stage. No histological or cytological responses by the host to parasitism were observed.

The data on anatomy and life history of the various species of Unionicolinae prompted the establishment of four general assumptions concerning the nature of the ancestral stock: (1) parasitism among the Unionicolinae is unrelated to and fundamentally different from that of other water-mites; (2) members of the ancestral stock oviposited in animal tissue; (3) the ancestral form preyed on zooplankton; and (4) originally the host served only as a protected place for transforming stages. Based on these assumptions, it would seem that parasitism by the Unionicolinae developed as follows: (1) loss of parasitic tendencies in the larva; (2) utilization of an animal host for protection during periods of transformation; (3) the tendency for adults and nymphs to remain in the host where they fed on plankton collected by the host; and (4) adaptation to a sedentary parasitic life.

84 pages. \$1.05. MicA54-1877

NATURAL HISTORY STUDIES ON THE
EARTHWORMS OF MICHIGAN

(Publication No. 8388)

William Roger Murchie, Ph. D.
University of Michigan, 1954

The objectives of this study were to determine: (1) the species of earthworms occurring in Michigan, their distribution, relative abundance, and habitat preferences; (2) the significance of physico-chemical factors of the soil in earthworm distribution; (3) the effects of seasonal cycles of moisture and temperature on earthworm activities; (4) the relationship of these factors to cyclic phenomena apparently inherent in the several species; and (5) the salient features in the life histories of two selected species.

Eighteen species of earthworms are now known to occur in Michigan of which eight are here reported from the state for the first time. One species, *Allolobophora minima* Muldal, has not previously been known from North America.

Such physico-chemical features as are treated in this study: pH, organic carbon, water holding capacity, and particle size, are secondary to drainage conditions insofar as their effects on earthworm distribution are concerned. Precise numerical limits for each of these factors cannot be established because compensating mechanisms may extend or restrict the habitat suitability in varying degrees. As the acidity of the soil increases beyond pH 6.0, the numbers of species and of individuals decline. Percentages of organic carbon below 0.30 and water holding capacity below 40 per cent exert a limiting effect in well drained soils. Similarly, in upland soils, sand content above 80 per cent is associated with a paucity of earthworms.

Field experiments in the form of measurement of the temperature and moisture changes in selected sites as well as physico-chemical analyses of the soil, indicate that available moisture, soil texture, and exposure are the controlling factors in the distribution of *Allolobophora caliginosa*, *Lumbricus terrestris*, *Eisenia rosea*, and *Diplocardia singularis*. *D. singularis* is the most tolerant species found in Michigan with regard to dry soil conditions followed by *A. caliginosa*, *L. terrestris*, and *E. rosea* in that order. Inherent cyclic behavior described by Avel (1928) was masked in the populations of the species here studied, owing to the moisture conditions prevailing in the areas investigated.

Collections made for one year at bi-weekly intervals demonstrated that in a population of *E. rosea*, the amount of available moisture in the soil is the primary factor in controlling the seasonal activities of this species and temperature is the secondary factor. The basis of this control is the imposition of a state of aestivation during periods of low soil-moisture content and during the winter months when the upper soil temperatures approach the freezing point. Sexual activities and growth are suspended during this aestivation period, whereas posterior

regeneration is initiated in many individuals when they are induced to enter the inactive condition.

The young of *Eisenia rosea* are capable of an extended cocoon-life when external soil conditions are unfavorable. Therefore, cocoon production is not a satisfactory criterion of reproductive periodicity.

During the spring months, when sufficient soil moisture is present to maintain the population of *Eisenia rosea* in an active condition, increasing soil temperature appears to govern the development of the clitellum.

The salient features of the life histories of *Bimastos zeteki* and *Allolobophora minima* are presented. The former is a large, widely distributed, but not abundant, woodland species. Its cocoons are larger than those of any other Michigan earthworm and are deposited under logs or in piles of leaf litter. *Allolobophora minima* is a true soil species, apparently restricted to the heavier soils with a high moisture stability. Viable cocoons are found throughout the year. These cocoons are encased in a capsule of soil composed of cast material. Cocoon and capsule are placed in a small chamber formed in the burrow. Only one embryo develops in each cocoon. Newly emerged young measure about 14 millimeters in length.

296 pages. \$3.70. MicA54-1878

LIFE HISTORY OF THE LAKE HERRING,
LEUCICHTHYS ARTEDI (LE SUEUR),
OF GREEN BAY, LAKE MICHIGAN

(Publication No. 8415)

Stanford Henry Smith, Ph. D.
University of Michigan, 1954

The lake herring is the leading species in the commercial fish production of Green Bay. The purpose of this study has been to investigate the life history of this highly variable fish in the complex aquatic environment of Green Bay, and to determine how it is influenced by the intensive commercial fishery.

This study is based on field observations, and various data from about 6,500 lake herring collected over the period 1948-1952. Relatively non-selective commercial pound nets have been a primary source of material for the study of age and growth. However, a limited amount of data from commercial gill nets has been employed to compare the two principal kinds of gear used to capture lake herring commercially. Experimental gill nets were fished in 1952 to study the vertical distribution of this fish in spring, summer, and fall.

Scales were employed to investigate age, strength of year classes, and growth. The season's growth starts in May and June; the younger and smaller fish start to grow earliest. Growth progresses most rapidly in July and is completed for the year near the end of October. The sexes grow at the same rate. Selective cropping of larger, faster growing fish by the commercial fishery leads to systematic discrepancies among the growth histories of members of

the same year classes at different ages. First-year growth declined progressively from southern to northern Green Bay. Annual fluctuations in the growth rate were small. Growth compensation was shown to result from differences in the time of hatching and from dependence of subsequent growth on size rather than age. Weight of fish of the same length varied with sex and with method, season, and year of capture.

Females were relatively more plentiful in commercial catches in February than in May through December. The percentage of females decreased with increase in age in pound-net catches but increased with age in gill-net samples. Within a year class the percentage of females decreased with increase in age. The relative abundance of females has declined during the period 1949-1952.

Some Green Bay lake herring mature in their second year and all are mature by the end of their third year of life. They are pelagic spawners. Most intensive spawning takes place over shallow areas but it also occurs in nearly all sections of the Bay. Individual schools of lake herring spawn sometime between mid-November and mid-December. Within a single school older and larger fish spawn earliest, and males expend their sex products at a faster rate than do females. The number of eggs in lake herring ovaries varied from 3,471 to 11,212 and averaged 6,375. Eggs hatch in April and May, and recently hatched fry are pelagic.

Lake herring were distributed at all depths in Green Bay in early May but were concentrated within 30 feet of the surface in late May. They moved to deeper water in June and were restricted to depths greater than 30 feet in July when temperatures in shallower water became unfavorably high (greater than 18° C.). In October the lake herring were again at all levels but were most abundant in the upper 30 feet. The lake herring is non-migratory but sometimes must move considerable distances to escape unfavorable temperature conditions. Local movements represent feeding activities and transport by currents. Activity varied little during the May-July period but increased in late October, 3 weeks prior to the start of spawning.

Although the lake herring population of Green Bay is measurably modified by the intensive commercial fishery the probability of depletion by present fishing methods is small.

172 pages. \$2.15. MicA54-1879

DETERMINATION OF THYROID-STIMULATING
HORMONE (TSH) IN THE BLOOD OF ADULT
WHITE LEGHORN CHICKENS

(Publication No. 8801)

Robert Alexander Tolman, Ph. D.
Indiana University, 1954

Newly hatched White Leghorn cockerels in a state of inanition were used to assay for Thyroid-Stimulating Hormone (TSH) and proved to be sensitive assay animals. The birds were injected two or three

times per day for a total of five to eight injections. Preliminary experiments indicated that sufficient TSH was present in the blood serum of adult White Leghorns chickens to cause a significant increase in thyroid cell height, but not in thyroid weight of assay birds. The difference in sensitivity between thyroid cell heights and thyroid weights is thought to reflect variations in colloid content of the gland.

Comparison of thyroid cell heights from assay birds injected with normal adult chicken blood serum, with cell heights of birds injected with thyrotropin reference standard indicated that less than the equivalent of 0.049 USP thyrotropin units were present in the blood.

Whole blood was fractionated into serum, plasma, and red blood cells, and each fraction, as well as whole blood, was assayed for thyrotropin content. The results indicated that plasma and red blood cells contained more thyroid-stimulating activity than whole blood or serum. When 0.05 USP units of thyrotropic hormone were added to each blood fraction and each fraction was assayed, the thyroid cell heights of the assay birds were not increased as much as they were when TSH alone was injected. This indicates that the blood inactivates a portion of the thyrotropic activity. Plasma inactivated more TSH than whole blood or any other blood fraction.

Lyophilized blood serum equivalent to 3 cc. of normal serum did not show any TSH activity. The TSH may have been destroyed during lyophilization or there may have been sufficient thyroxin in the lyophilized material to inhibit the effects of TSH.

Adult chickens were injected with various substances which are known to alter pituitary cytology. Thyrotropin content of the serum was then determined in order to study the effects of these treatments on TSH production.

1. Two doses of ACTH were administered. 350 gamma daily caused a slight decrease in serum TSH content, while with 50 gamma daily, no TSH was detectable in the serum. It is postulated that the ACTH preparation was contaminated with TSH.

2. No TSH was detected in the serum of chickens which had been injected with 25 gamma per day of estradiol. These results may mean that sufficient estrogen was present to inhibit completely the secretion of TSH by the pituitary, or that a slight stress reaction was set up by the estrogen injection which caused thyroid inhibition by increased adrenal cortical hormone production.

3. Castrated birds had less TSH in the serum than normal untreated birds.

4. 0.1% thiouracil was expected to cause an increase in blood TSH titer, but a decrease in serum TSH was found. It is postulated that the decrease was due either to a stress reaction, or to increased metabolism of TSH by the hypertrophied thyroids, or to a combination of these two effects.

5. No conclusions have been drawn from these experiments regarding cell source of ACTH, TSH or gonadotropin.

Cell height measurements of thyroids of chicks injected with thyroxin or TSH or combinations of the two, showed that 1 ugm of thyroxin caused

increased cell height instead of the expected decrease. 0.025 USP units of TSH in combination with thyroxin caused increased cell heights, indicating synergistic action between the hormones. Other combinations of the hormones caused decreased cell heights. Two possible explanations are given for these results: 1) increased thyroid cellular metabolism, or 2) increased pituitary cellular metabolism, with increased TSH production.

42 pages. \$1.00. MicA54-1880

HABITAT SELECTION OF CAVERN-DWELLING BATS AS ILLUSTRATED BY FOUR VESPERTILIONIDS

(Publication No. 8427)

John W. Twente, Jr., Ph. D.
University of Michigan, 1954

This is a report on studies of behavior in relation to habitat of populations of bats in gypsum caverns in south-central Kansas and northwestern Oklahoma. The species involved were Myotis velifer, Corynorhinus rafinesquei, Antrozous bunkerii, and Eptesicus fuscus.

Movement was studied by banding. Corynorhinus and Eptesicus awaken and move from cavern to cavern throughout the winter and never return to exactly the same place. Myotis tend to remain in the same cavern. Homing experiments show that bats will sometimes return to the cavern from which they were taken, though they will also fly to other caverns. Experimental evidence indicates that bats may find cavern entrances by following sounds of active bats within.

Some hibernating individuals are irritable and awaken easily; others can be triggered to awaken only by relatively violent disturbance. Once the awakening reaction is initiated, a constant and rapid temperature rise continues until flight is possible. The degree of irritability of torpid bats is directly related to the area under the time-temperature curve and consequently to the amount of food that has been catabolized. Irritability may be dependent upon the amount of urine in the bladder and the nervous consequences of a filled bladder; possibly this mechanism is a general phenomenon in hibernating mammals.

Habitat selection of these bats is controlled by the relative temperatures within the caverns and the structural characteristics of the ceilings. Hibernating Corynorhinus hang singly on rough surfaces which offer a more static environment than smooth surfaces which are disturbed by warm air currents. Hibernating Eptesicus are found singly in horizontal crevices. A colony of hibernating Antrozous was in a ceiling crack in one cavern. Micro-climatic measurements show that bats can detect relative differences in temperature. They hang in the cooler parts of the cavern when they do not feed and in the warmer places after feeding. There were no differences in the temperature or humidity of the sites

selected for hibernation by *Myotis*, *Corynorhinus*, or *Eptesicus*.

In the hibernating season, dense clusters keep the bats cold; in the feeding season they keep them warm. The relative temperature of the cluster is dependent upon the irritability of the bats within it. The development of the clustering instinct of baby *Myotis* is gradual and is not fully developed until the juvenal pelage is grown.

The distribution of clusters of hibernating *Myotis* was plotted at different times. In the fall and spring, small clusters are scattered throughout the cavern. In the winter, clusters are larger and primarily concentrated in favorable (cool and undrafty) places. Bats in unfavorable places become irritable and move more frequently than those in favorable places. Behavioral response to environmental change is largely passive and dependent upon the metabolic

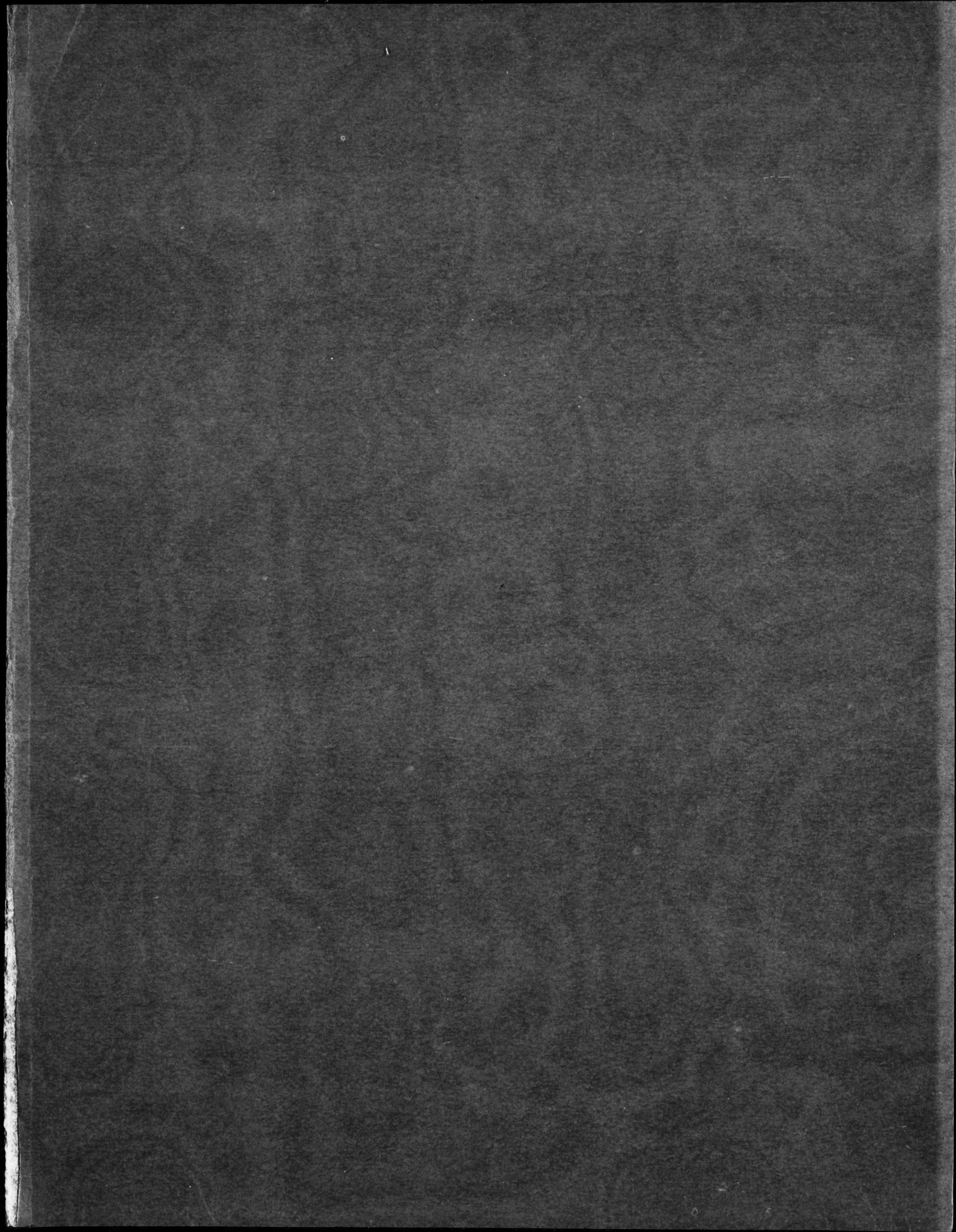
rate. Habitat selection, then, is partly trial-and-error.

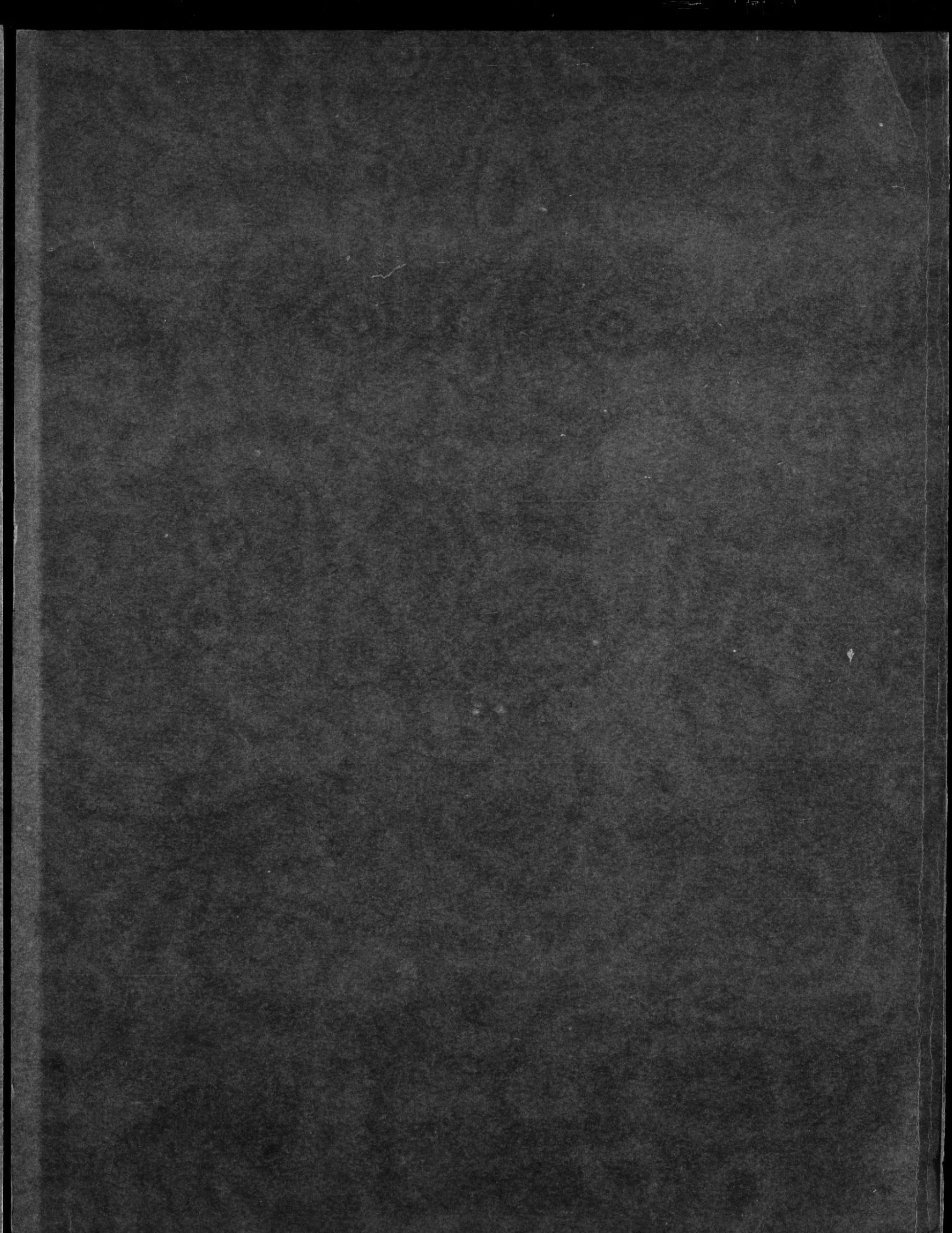
Weights of bats show a sharp increase in October followed by a decrease, when hibernating, related to the temperature of the caverns.

Myotis, *Antrozous*, and *Corynorhinus*, before emerging to feed, utilize a light-sampling technique of flying into the lighted zone and returning to the darkness of the daytime quarters until the illumination of the sky reaches a certain intensity. This intensity is different for each species.

Bats are unique among small mammals in having a low reproductive potential. Social behavior does not seem to limit population size, but rather to favor survival of all of the members; population size may be primarily limited by predation.

163 pages. \$2.04. MicA54-1881





DISSERTATION ABSTRACTS

Volume XIV, No. 9

1954